American Machinist

METAL SHOW NUMBER

October 6, 1937

Metal Men Meet—Atlantic City will play host to the National Metal Congress, October 18-24

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McGraw-Hill Publishing Company, Inc.

Publication office, 99-129 North Broadway, Albany, N. Y. Editorial and executive offices, 330 West 42nd Street, New York, N. Y. Branch offices: Chicago, 520 North Michigan Ave.; San Francisco, 883 Mission St.; Aldwych House, Aldwych, London, W. C. 2; Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta.

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AMERICAN MACHINIST. Published every other Wednesday, price 35c a copy. Subscription rates—United States, Canada, Mexico, and Central and South American countries, $3.00 a year. All other countries (except Europe and British possessions, in Eastern Hemisphere), $6.00 a year or 24 shillings. Entered as second class matter, September 29, 1936, at Post Office, Albany, N. Y., under the act of March 3, 1879. Printed in U. S. A. Cable address "McGrawhill, New York," Member of A.B.P. Member of A.B.C. McGraw-Hill Publishing Co., Aldwych House, Aldwych, London, W. C. 2, England will serve with the European edition, all subscribers in Europe and British possessions in Eastern Hemisphere—subscription rate 35 shillings for one year.

Volume 81 Number 20

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SHOW SECTION

The Metal Congress 883a

1937 Progress in the Metal Industry.....*Edgar C. Bain* 883b

Technical Society Programs..... 883d

List of Exhibitors..... 883g

The Show In Print..... 883

FINISHING AND TESTING

Process Control of Production Plating....*Walter R. Meyer* 904

Luster for Stainless.....*R. R. Curry* 908

Why Dynamic Testing?.....*Rudolf K. Bernhard* 911

WELDING

Metal Cutting With the Electric Arc....*Charles H. Jennings* 916

Fixture Tables Control Welder Economy.....*H. W. Roth* 922

Economical Press Tools Through Welding..*Kenneth Brainerd* 929

Weld Filler Metal..... 931

Mechanized Flame Cutting.....*H. F. Reinhardt* 934

HEAT-TREATING

Mechanized Heat-Treating of Buick Gears..*Burnham Finney* 938

"Dishing" During Heat-Treatment.....*John W. Quantius* 945

Clean-Hardened Pen Points 946

Temperature—Measured and Controlled.....*R. R. Wiese* 947

Tricks for Heat-Treaters..... 958

DEPARTMENTS

Shop Equipment News.. 900 News 914b

Industrial Review ..... 914a Detroit Letter 914c

Watching Washington . 914e

THE METAL SHOW IN PRINT

The National Metal Congress and Exposition (opening at Atlantic City on October 18th) is the year's big event in metals and alloys, and metal treatment. It contains many developments and ideas that you can capitalize in a practical way.

This whole issue is devoted to the Show. Editorial pages . . . advertising pages . . . will help you comb the new things in metals, alloys, cutting alloys, welding, heat treating, finishing, etc. The issue will save you time and assure that you don't miss anything important.

If you are going to the Show, use this issue to plan your visit. Here are full details about the exhibits and programs.

If you cannot go, this issue gives you the next best thing . . . **the Show in print.**

AMERICAN MACHINIST

Accepted FOR ITS ADAPTABILITY

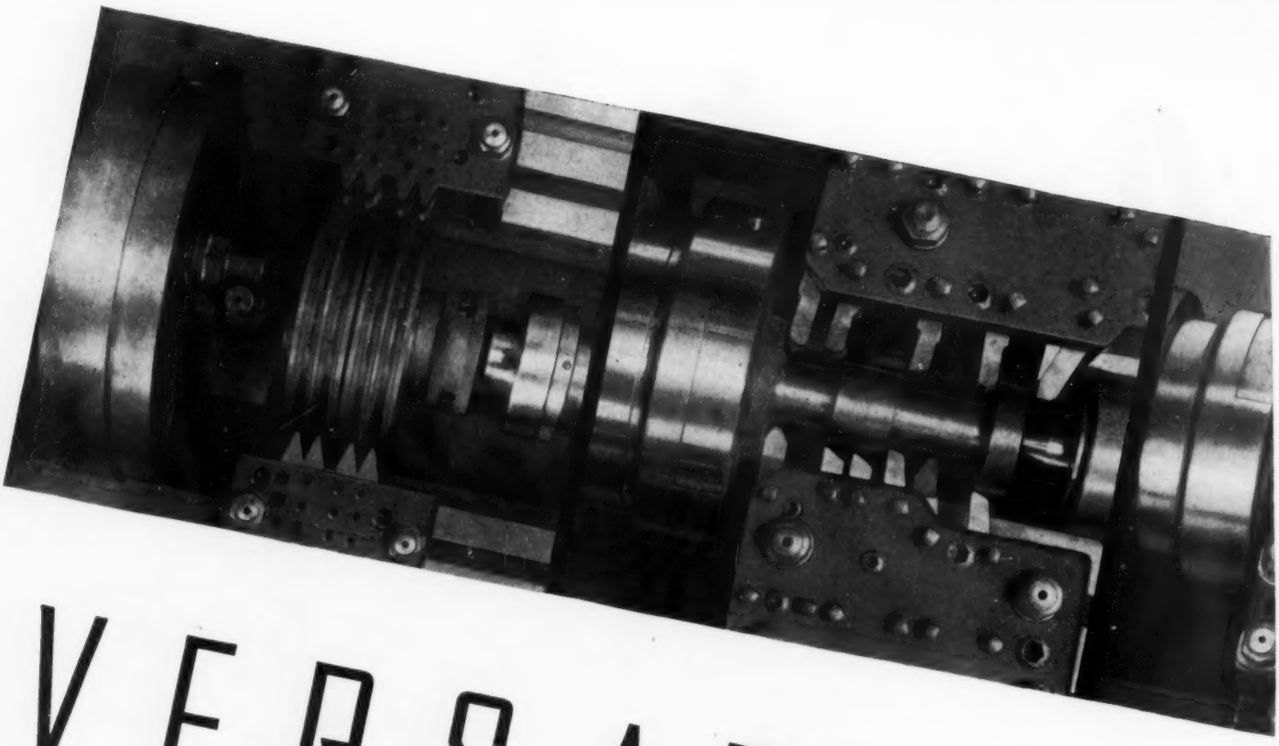
12″ Straight Bevel Gear Generator

ADAPTABILITY is the essential feature of this machine. Simplicity of operation and speed in setup make it the ideal machine for both job shops and production plants, a machine for cutting 10 or 10,000 Straight Bevel Gears. Capacity: 24″ pitch diameter . . . 10 to 1 ratio . . . 3 diametral pitch . . . 3½″ face.

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy Years

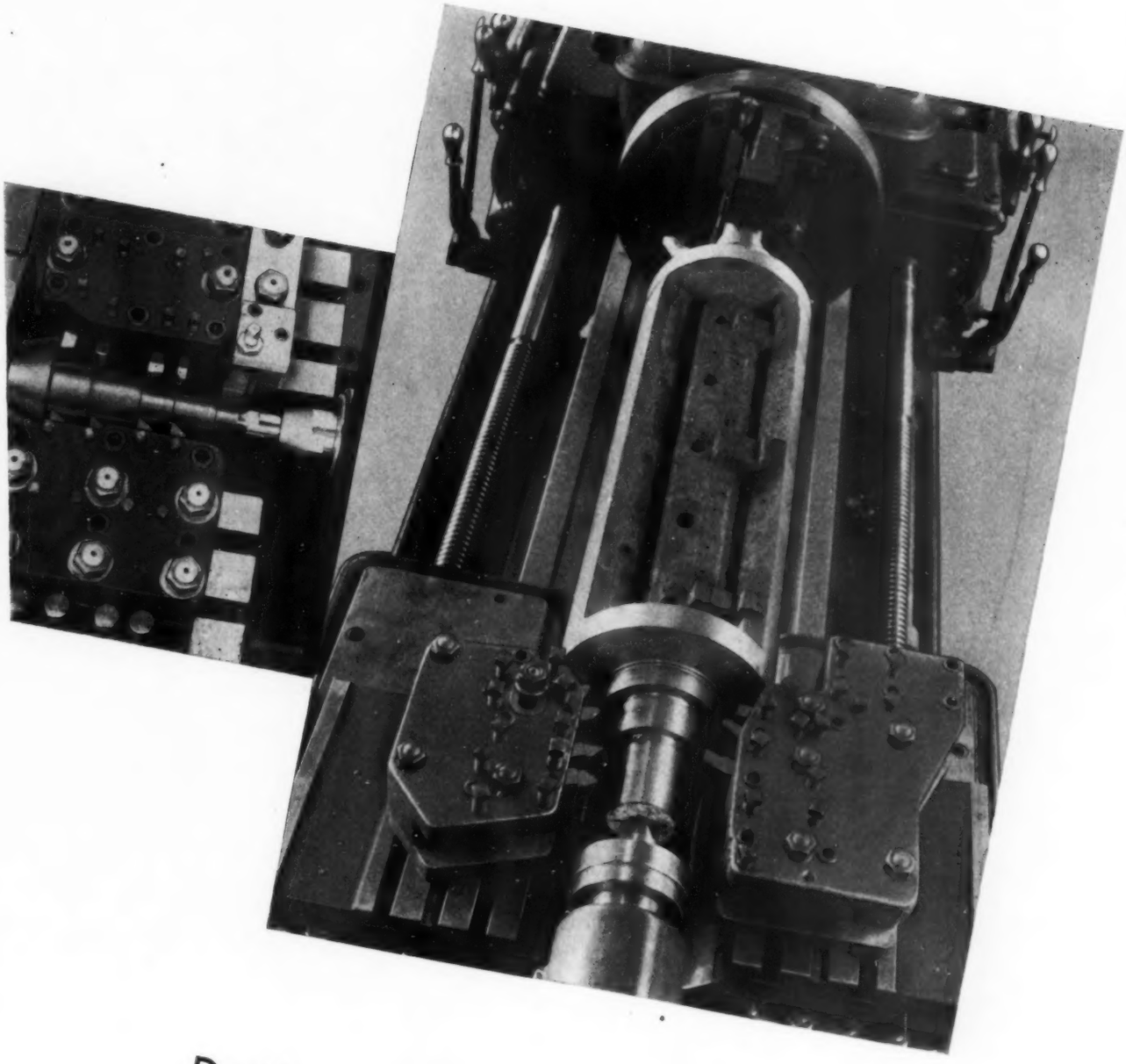
1000 UNIVERSITY AVENUE, ROCHESTER, N. Y., U. S. A.



VERSATILE!

Handling, as it does, an almost infinite variety of production turning jobs, the No. 3 DUOMATIC possesses a speed and ease of handling that builds profit for the shop and good will from the operator. An utter absence of "gadgets" and a concentration of essential controls, facilitates set-ups, reduces operator fatigue and speeds production, whether the machine be set up for one job or transferred from job to job. Sheaves, pinion gears, cluster gears and press cylinders all lend themselves to the profit making ability of the Duomatics.

THE LODGE & SHIPLEY MACHINE TOOL CO.
CINCINNATI, OHIO, U. S. A.



Do You Have Your Copy of

"MORE MINUTES PER HOUR"

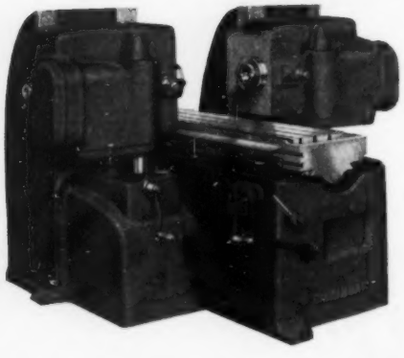
No Obligations—Write for Yours

From STANDARD to *and Back!*

DOES your type of milling work require a special machine? Of course, a machine built for one purpose produces much faster, and quality is more easily controlled. But what of the future, when competition forces a change in design?

With the Cincinnati Hydromatic plan of construction, you are not tied down with a useless white elephant after your designs are changed. For these machines, though built for a special purpose, are built up of standard units. And the Hydromatic can be changed back to a standard general purpose machine when necessity dictates.

Write for catalog M-655 and see how this is done. Or, call in one of our milling specialists for advice.



CINCINNATI

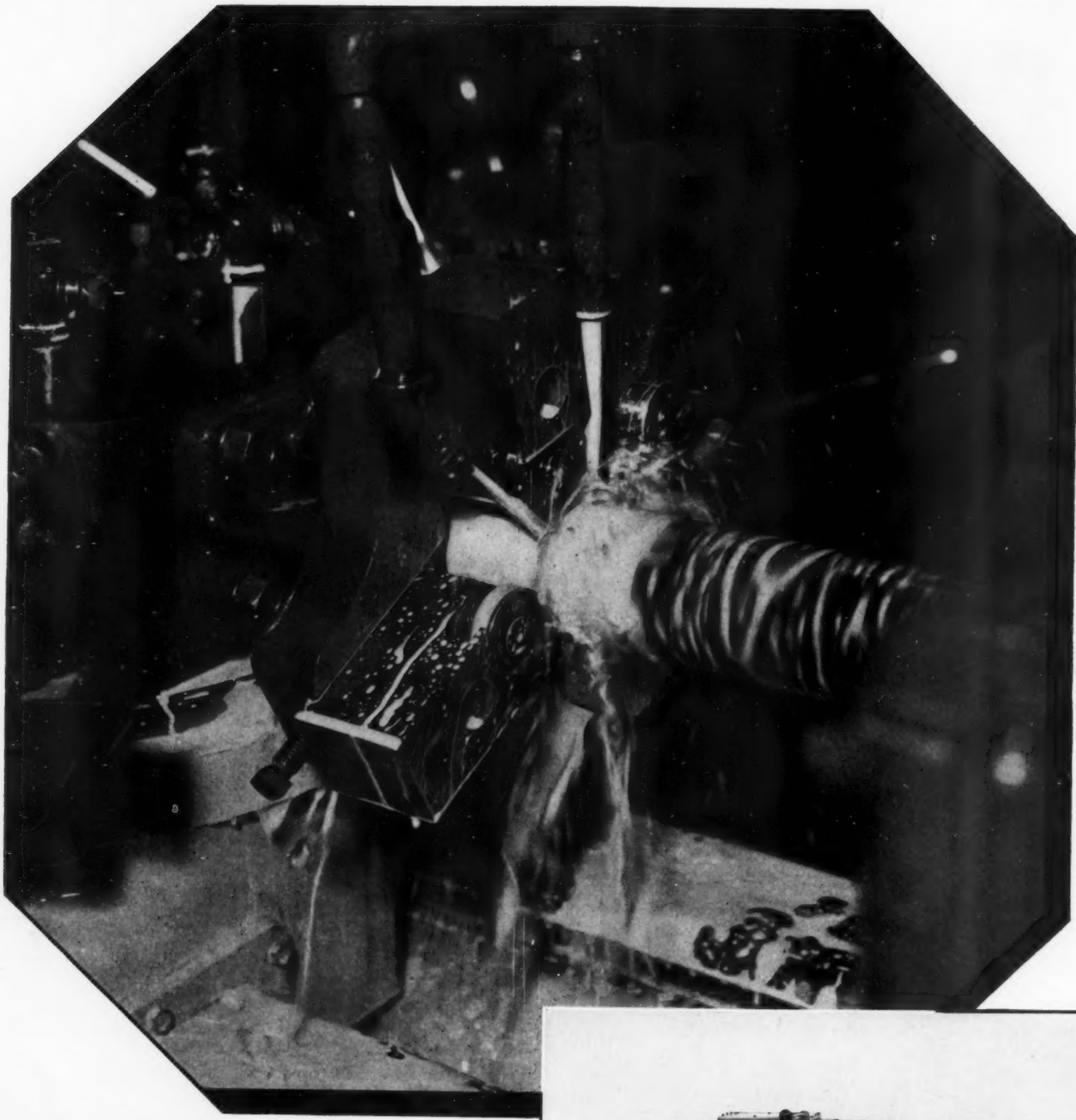
A SYMBOL OF A DEFINITE STANDARD OF WORTH

The Cincinnati Duplex Hydromatic Milling Machine

Patented

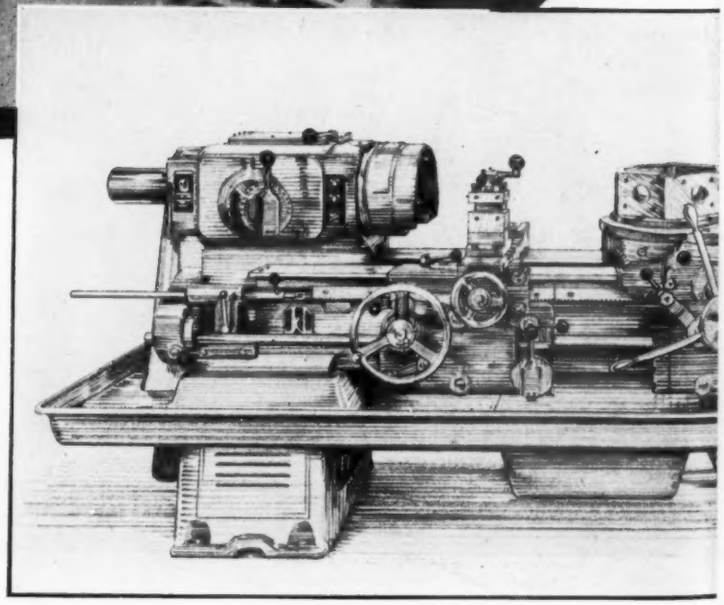
THE CINCINNATI MILLING MACHINE CO.
Cincinnati, Ohio, U. S. A.

Here is an example of a standard unit Cincinnati Hydromatic for single purpose work, milling 4 surfaces on a front bolster for a tractor. The close coupled spindle carriers may be replaced by the conventional carriers, if necessary.



AUTOMATIC COOLANT DISTRIBUTION TO THE FACE OF EACH TURRET IN WORKING POSITION

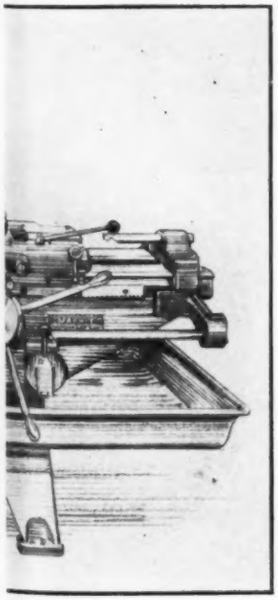
JONES & LAMSON
MACHINE COMPANY
•
SPRINGFIELD, VERMONT
U. S. A.



2½ x 40" J & L SADDLE TYPE TURRET LATHE

J&L

PREDICTION OF PROFITS

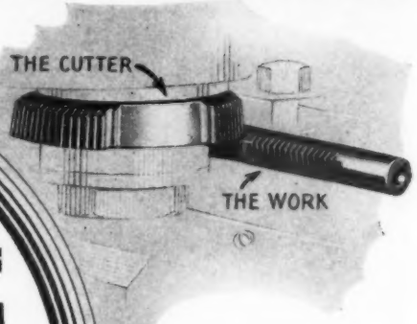


New turret lathe equipment is essential to those interested in keeping costs at a minimum and profits at a maximum. Profits are the responsibility of the operator. He must, therefore, use less time and effort per piece produced, and less time for a change of jobs. He must produce more accurate parts. The Jones & Lamson Turret Lathes are designed to *assure* the operator aid on all these points—points that keep costs where they belong. . . . A thorough study of the J&L line of turret lathes will show you how these machines are able to save up to 60% on turning work. Are you sure such savings are not possible in *your own* shop? . . . A J&L engineer is at your service to study your particular needs. Call him in; there is no obligation.

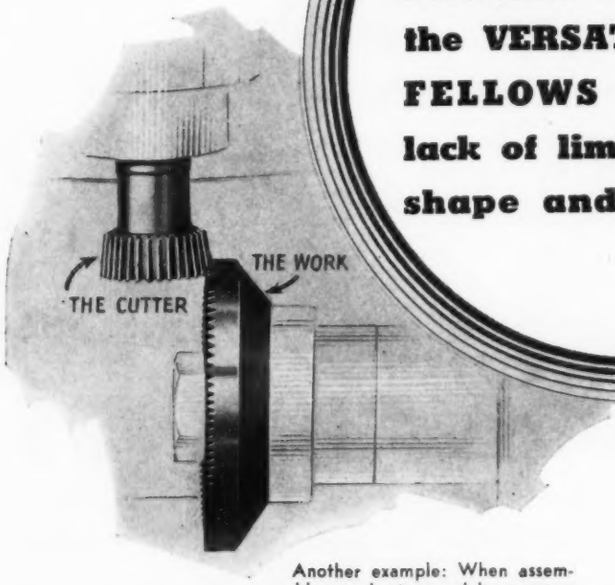
THE FELLOWS A Process

This special-purpose Cutter is cutting an hourglass worm for a sound movie projector where absolute silence is an essential factor in a right angle gear drive.

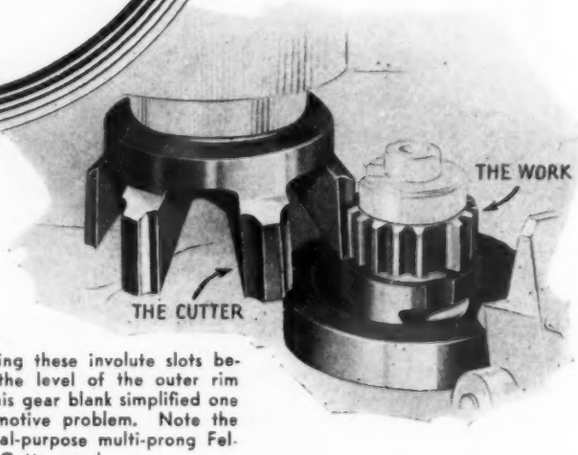
THE FELLOWS MOLDING-GENERATING PROCESS centers around the VERSATILITY of the FELLOWS CUTTER — its lack of limitations as to shape and application.



In this case Gear Shaper Versatility is exemplified in the cutting of an involute rack for a Diesel Engine valve-operating mechanism.



Another example: When assembly was best served by a crown gear type of clutch, the Gear Shaper made this form of design economically possible.



Cutting these involute slots below the level of the outer rim on this gear blank simplified one automotive problem. Note the special-purpose multi-prong Fellows Cutter used.

The Fellows Line of Products includes:

GEAR SHAPERS • HOURGLASS GEAR SHAPERS • COMPLETE LINE OF CUTTERS • THREAD GENERATORS • MASTER GEARS • LAPS AND LAPPING MACHINES

GEAR SHAPER METHOD

of *Broader Application*

for

1. **MORE COMPACT DESIGNS**
2. **HIGH ACCURACY**
3. **LOWER COSTS**

Well informed production executives are aware that close control over accuracy is absolutely essential if one is to put high production on a low cost basis. No other method affords as close control over accuracy as the Gear Shaper, and no other is as capable of wide application.

Fellows Cutter-grinding provides you with a tool—designed to meet your special requirements — which embodies the highest precision available to commercial production use. It converts the Gear Shaper into A SPECIAL PURPOSE MACHINE at much less cost than one of special design and naturally of more limited application.

You will find that the Gear Shaper is an exceptionally profitable investment. Why not let our Engineering Department help you cut your costs and improve your product. Incidentally, our booklet, "The Practical Art of Generating," will show you what has been done on the Gear Shaper. For your copy, write: The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Bldg., Detroit, Mich.

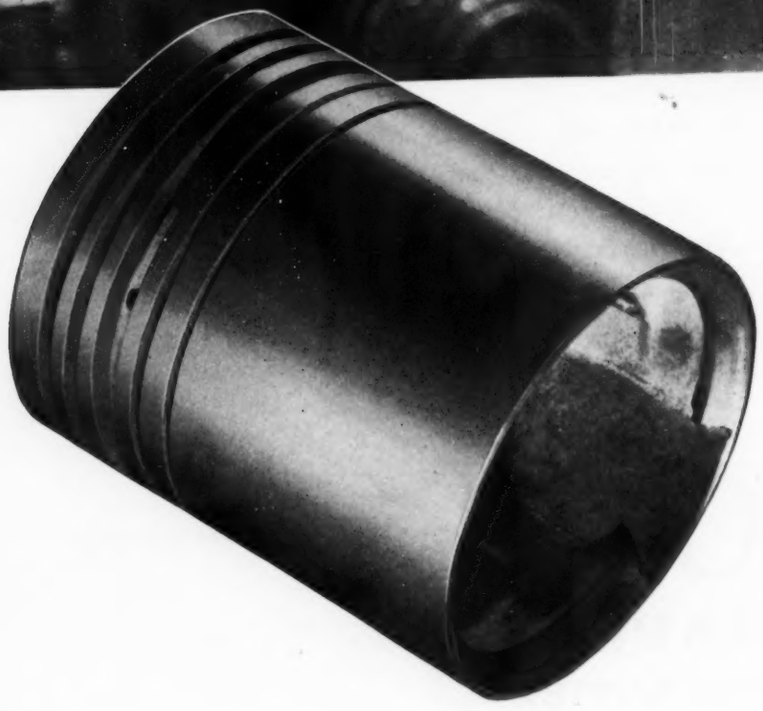
HELICAL CUTTER SHARPENERS

FELLOWS

BURNISHING GEARS • TESTING EQUIPMENT

-GEAR SHAPERS-

AND GEAR SHAPER CUTTERS



CINCINNATI

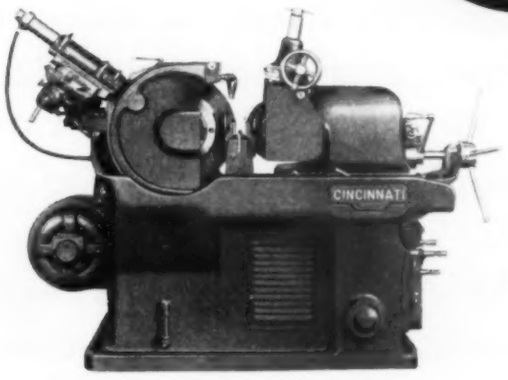
A SYMBOL OF A DEFINITE STANDARD
OF WORTH

AND *Smooth* . . .

A roughing and a finishing cut simultaneously. The Cincinnati Centerless in the picture is doing just that . . . roughing the skirt diameter while finishing the ring land diameter of tractor pistons. An infeed cycle is required for this operation, and 50 pistons, 4¼" diameter x 5", are ground each hour. Subsequent thru-feed Centerless operations finish the skirt diameter to a mirror surface, and maintain roundness and size tolerances measured in tenths of a thousand.

Our sales representative will be glad to tell you how the Cincinnati Centerless method can be applied just as profitably to your kind of work, whether your lots are run in small quantities or thousands. Meanwhile, write for circular G-400.

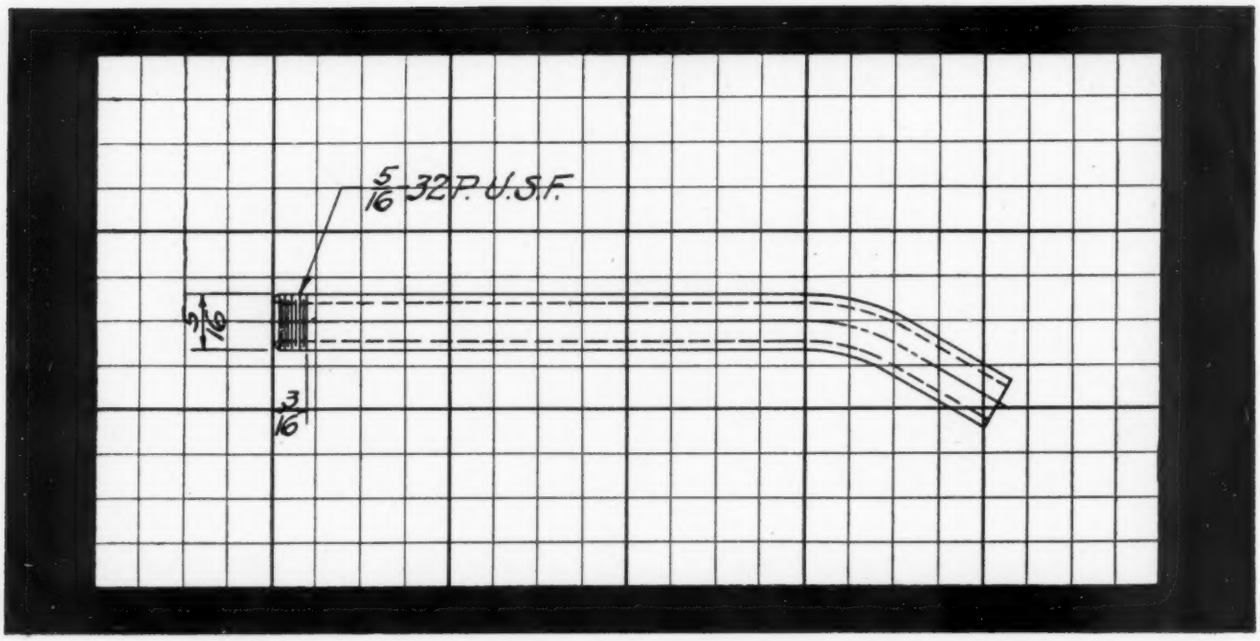
Both Centerless and Center Type Grinders



The No. 2 Cincinnati Centerless Grinding Machine
Patented

CINCINNATI GRINDERS INCORPORATED
CINCINNATI, OHIO, U. S. A.

Accuracy is with



The Fitzsimmons Manufacturing Company, Detroit, Michigan, use hardened and ground LANCO Die Heads for threading Ford Oil Cap Tubes.

The thread is not unusual nor is the seamless steel tubing of which the oil cap tube is made, particularly tough, but the real story is one of *undiminished* quality for many threads.

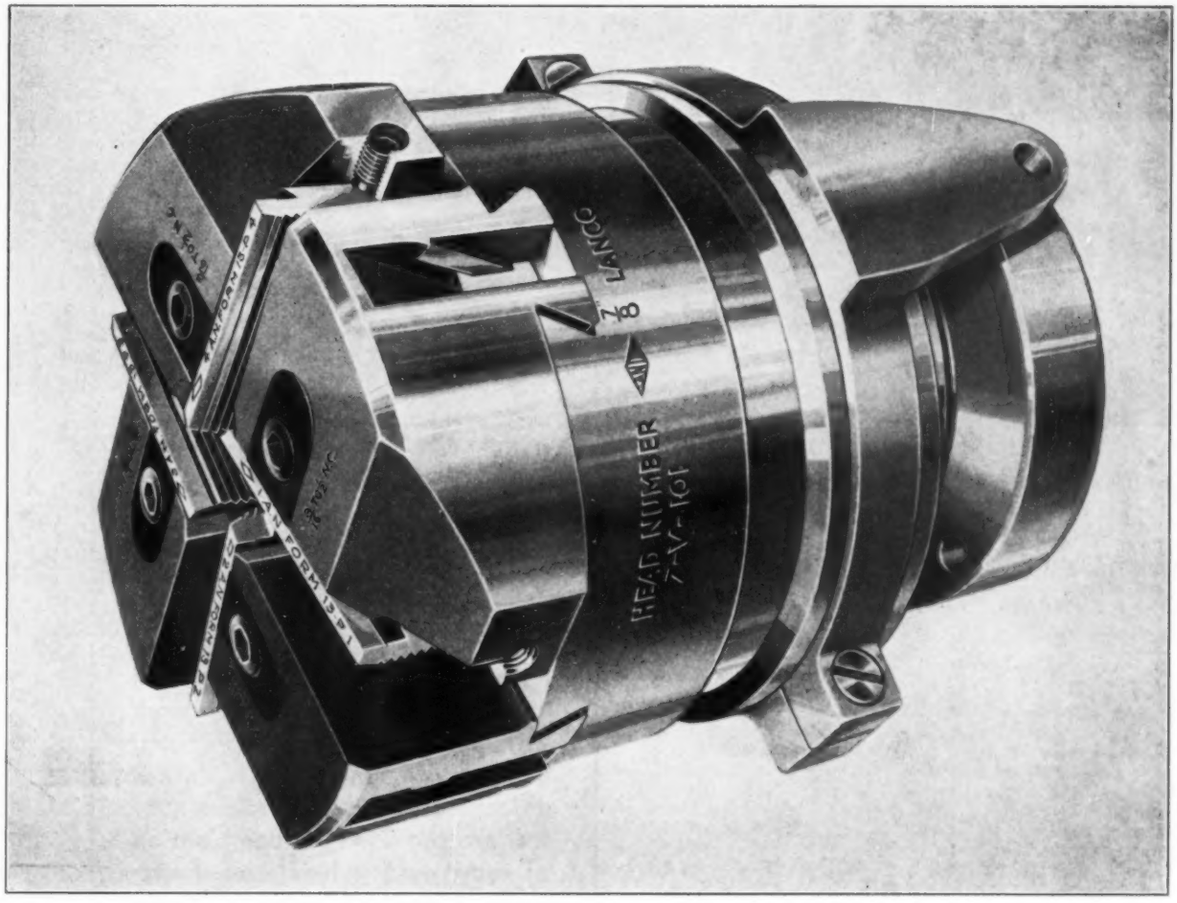
Specifications require a .0022" limit on pitch diameter. A 7-8" Type "V" LANCO Head with LANDIS Patented Tangential Chasers average *12,000* threads per grind of the chasers, and hold well within the .0022" limit.

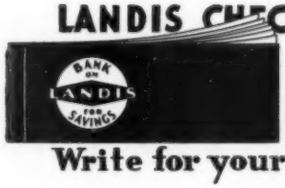
The LANCO Type "V" Die Head may do as well on your threading operations. May we send you details?

LANDIS MACHINE CO., INC.

constant

LANCO HEADS





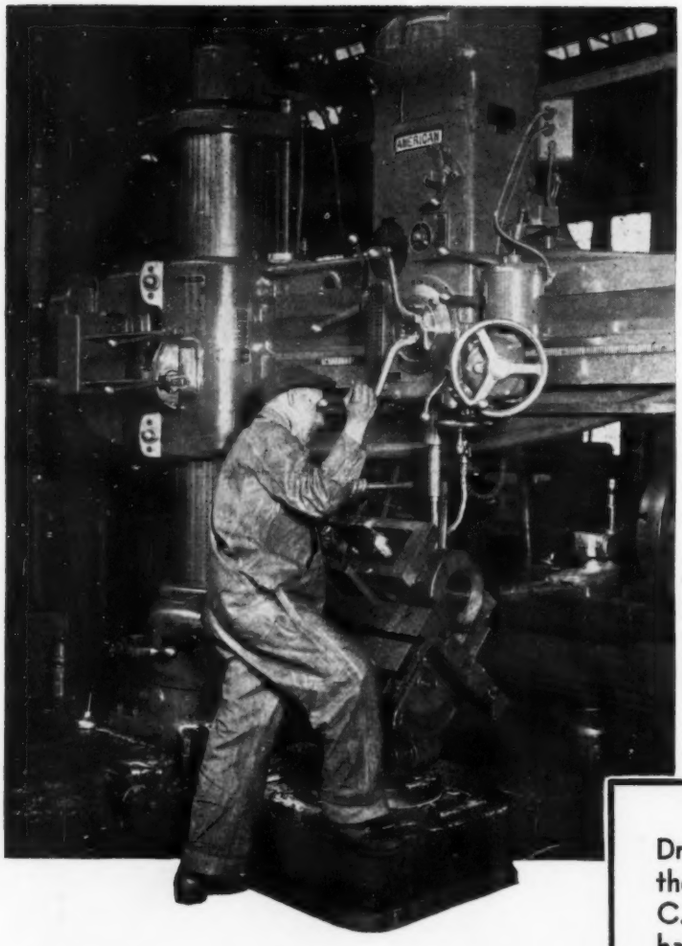
LANDIS CHECK ✓ BOOK

. . . are you handling your threading jobs efficiently?

. . . . . The Check Book will tell you!

Write for your copy today

WAYNESBORO, PENNA.



This

"AMERICAN"

TRIPLE PURPOSE

RADIAL

Saves 40% in a railroad shop

Drilling locomotive crossheads in the Danville, Illinois, shops of the C. & E. I. Railroad is being handled at a big saving over previous methods since an "AMERICAN" took over the job.

"AMERICAN" Triple Purpose Radials combine unusual power and ruggedness for heavy work with ability to maintain precision under maximum demands. In addition, easy and convenient control are provided—a combination of operating advantages which make "AMERICANS" ideally suited not only to railroad shop requirements but also for handling all classes of heavy work at minimum cost.

You, too, can make worthwhile savings with "AMERICANS." Catalog "C" gives facts and figures. Write for it.

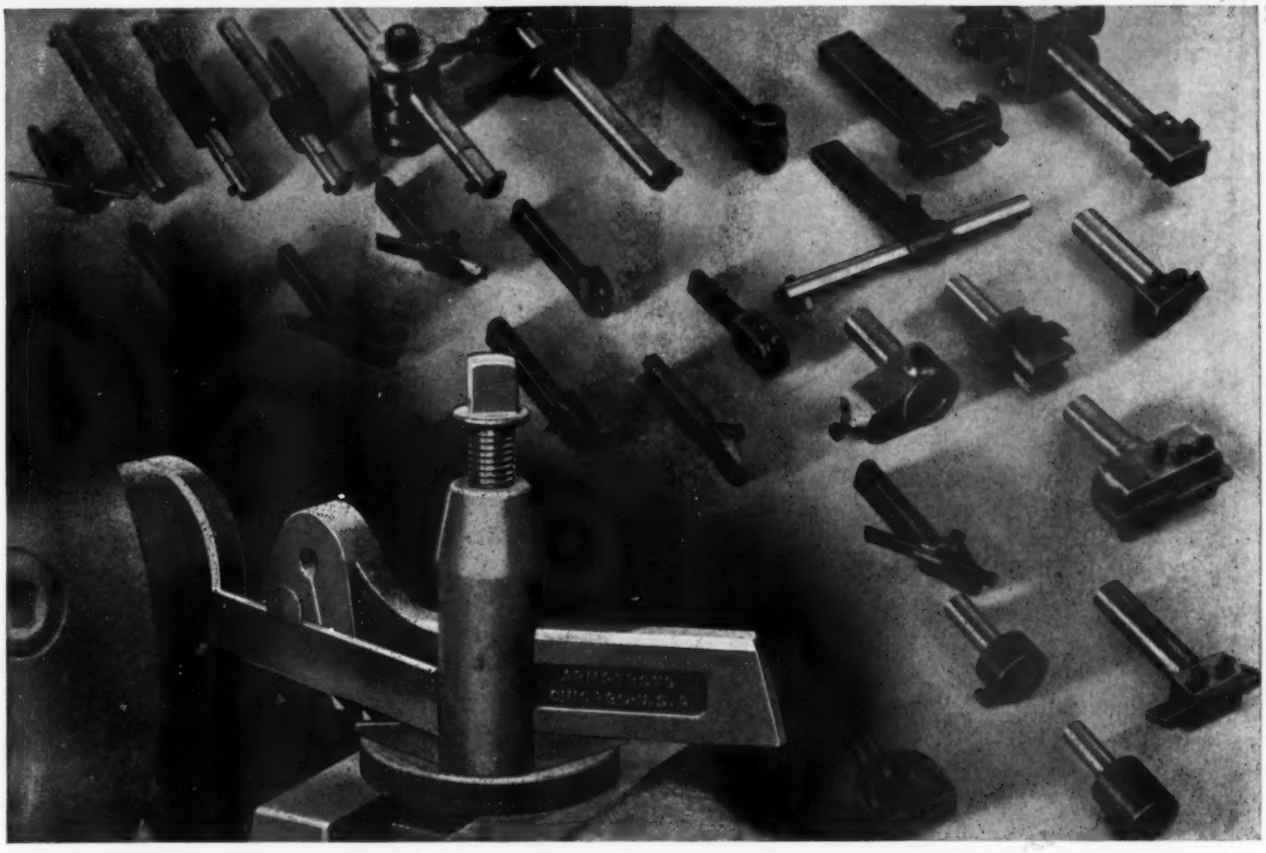
The

AMERICAN TOOL WORKS CO.

CINCINNATI, OHIO

LATHES-RADIALS-SHAPERS

ARMSTRONG



Take the final step in efficiency—the Complete Armstrong System

The first big step in cutting cutting-costs on lathes, planers, slotters and shapers is to replace all forged tools with ARMSTRONG TOOL HOLDERS thereby "Saving All Forging, 70% Grinding, 90% High Speed Steel," ending losses in costly tool stumps and uncertainty in tool performance. The second big step, equally important, is the adoption of the complete Armstrong System—the use of the right ARMSTRONG TOOL HOLDER for each operation.

Over 96% of the Machine Shops and Tool Rooms are using ARMSTRONG TOOL HOLDERS today. Each ARMSTRONG TOOL HOLDER is a permanent multi-purpose tool that with a few cutter bits quickly ground from standard high speed steel shapes, does the work of a complete set of forged tools. Because of this versatility and the extra strength and handiness of each ARMSTRONG TOOL HOLDER, there is often a tendency to use the tool holder at hand not only for the many jobs for which it is designed but also for operations on which other ARMSTRONG TOOL HOLDERS will prove more efficient. The Armstrong System comprises over 100 sizes and types of Tool Holders. Turning Tools, Threading Tools, Cutting-off Tools, Boring and Inside Threading Tools, each in many designs as well as special Shaper and Planer Tools, and Tool Holders for Turret Lathes and Screw Machines. Included are Spring Tool Holders with special advantages when machining tougher alloy steels, "Carbide" Tool Holders for holding carbide tipped bits, etc. All are instantly available—can be purchased out of stock from your local Mill Supply house. All are permanent tools—will give years of service. Each is so inexpensive that to substitute some less efficient tool or tool holder for its work, is "bad business." Make it your tool policy to use the right ARMSTRONG TOOL HOLDER for each operation; use the Complete System in your shop.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. Francisco Ave., Chicago, U. S. A.

Eastern Warehouse & Sales: 199 Lafayette St., New York, N. Y.

SAN FRANCISCO LONDON

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

On Models H and 2 & 3K Milwaukees the operator adjusts the drive clutch instantly *by hand*, either for slippage when frail saws become clogged or pulling through of rugged cutters.

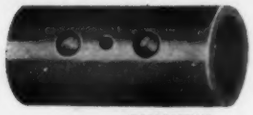
KEARNEY & TRECKER CORPORATION
West Allis Station MILWAUKEE, WISCONSIN

MORE THAN 39 years OF DOING ONE THING WELL

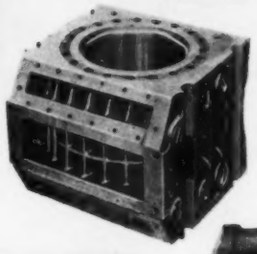
K&T

Milwaukee **MILLING MACHINES**

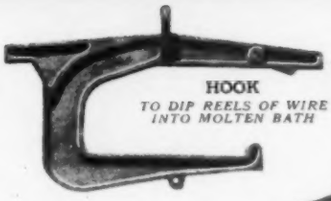
DIESEL BLOCKS



BUSHING

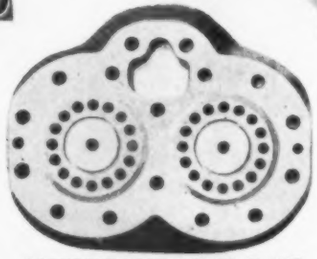


VALVE LINER



HOOK
TO DIP REELS OF WIRE INTO MOLTEN BATH

STOKER LINK



REFRIGERATOR VALVE PLATE

DIESEL PISTON

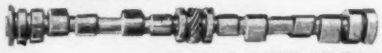
CRANKSHAFTS

BUBBLE CAP
OIL STILL

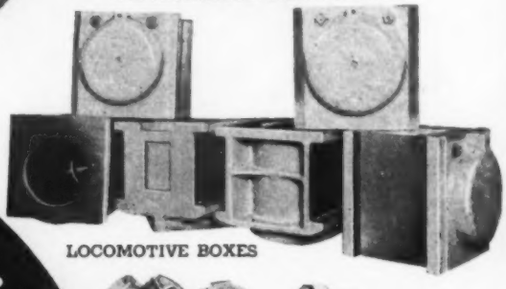
VALVES

TAPPETS

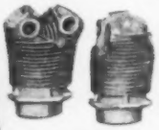
CAMSHAFT



OIL PUMP LINERS

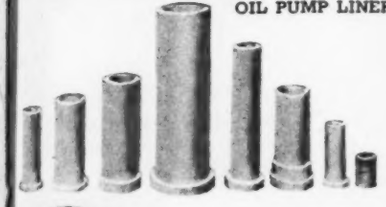


LOCOMOTIVE BOXES



AIRPLANE CYLINDERS

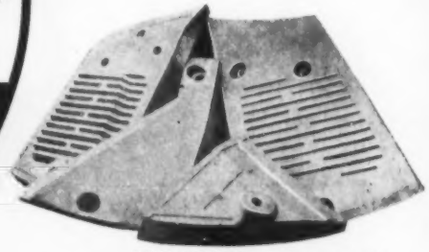
DIESEL ENGINE MANIFOLD



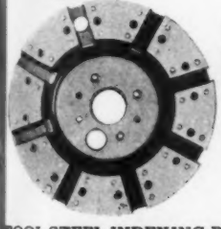
SPROCKETS
MADE IN ALL SIZES

MEEHANITE CASTINGS

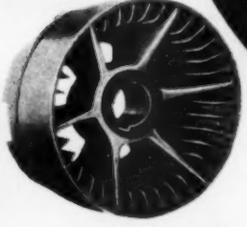
·DEPENDABLE·
·FREE MACHINING·
·STRONG· ·TOUGH·
·SOUND· ·DENSE·
·TRUE TO PATTERN·
·UNIFORM·



END LINERS *FOR BALL MILL*



TOOL STEEL INDEXING PLATES
NOW MADE ONE-PIECE MEEHANITE CASTING



COMBINATION CLUTCH & BRAKE
GIVING SUPERIOR SERVICE IN MEEHANITE

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COKE PRICKER RINGS
FLAME HARDENED

COFFEE MILL BURRS

BARREL FEED CAMS
FOR AUTOMATIC DRILLING MACHINES FORMERLY TOOL STEEL

HARDENED CAM

SCALE LEVER

ASH PUMP

CRANE BRAKE DRUM

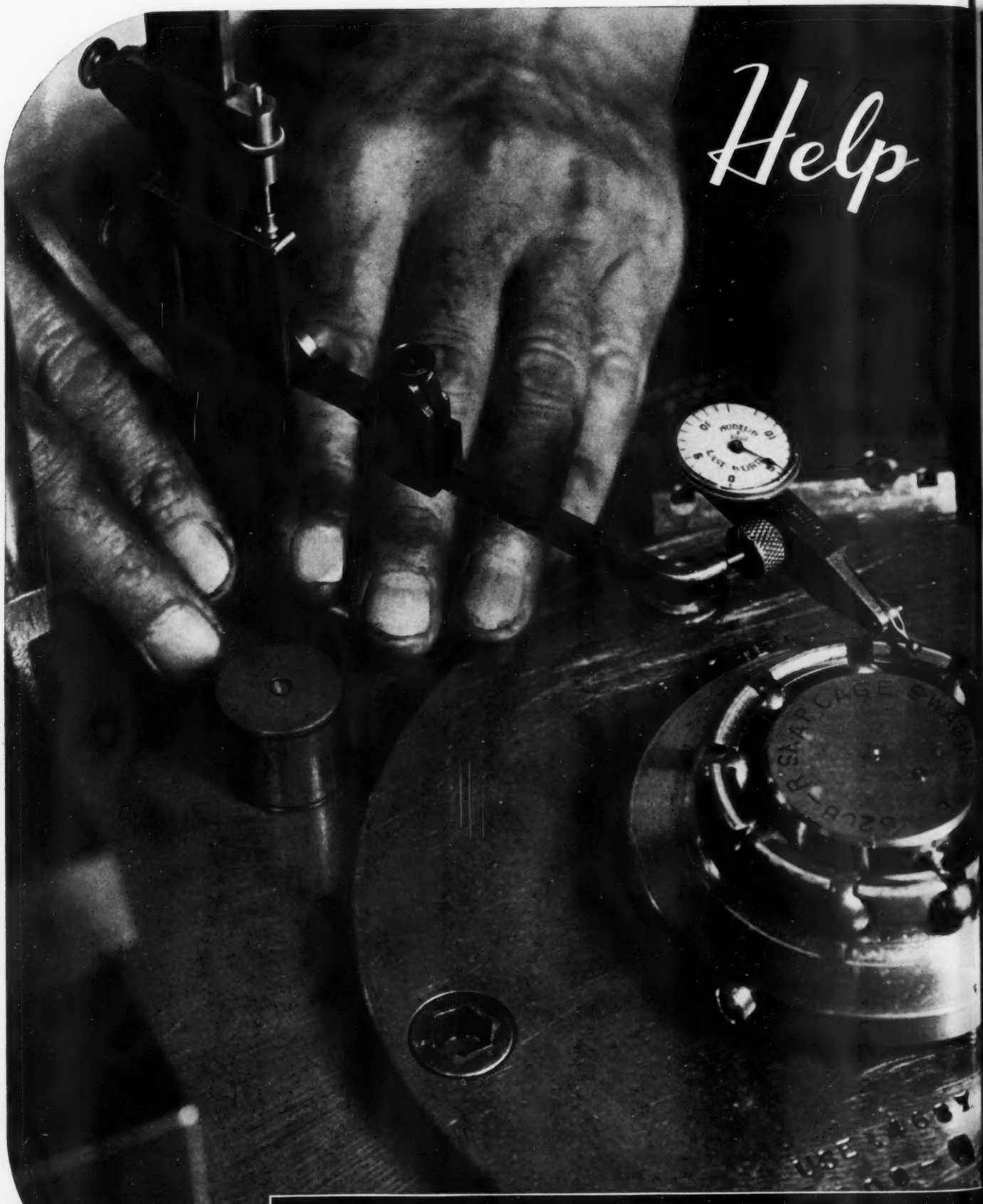
MEEHANITE IS PARTICULARLY ADAPTED TO SMALL AND MEDIUM WEIGHT CASTINGS WHERE ACCURATE DIMENSIONS AND CORING MUST BE OBTAINED, AND WHERE A CLOSE-GRAINED UNIFORM METAL IS NECESSARY.

MANUFACTURERS:

American Laundry Machinery Co. ..... Rochester, N. Y.
Banner Iron Works ..... St. Louis, Mo.
H. W. Butterworth & Sons Co. ..... Bethayres, Pa.
Cincinnati Grinders Incorporated ..... Cincinnati, Ohio
The Cincinnati Milling Machine Co. ..... Cincinnati, Ohio
Cooper Bessemer Corporation ..... Mt. Vernon, Ohio
Crawford & Doherty Foundry Co. ..... Portland, Oregon
M. H. Detrick Co. ..... Peoria, Ill. / Newark, N. J.
Farrel Birmingham Co. ..... Ansonia, Conn.
Florence Pipe Foundry & Machine Co. (R. D. Wood Company, Philadelphia, Selling Agents)

METAL
Registered Trade Mark

Fulton Foundry & Machine Co. ..... Cleveland, Ohio
G.H.R. Foundry Co. ..... Dayton, Ohio
Greenlee Foundry Company ..... Chicago, Ill.
Hamilton Foundry & Machine Co. ..... Hamilton, Ohio
Kanawha Manufacturing Co. ..... Charleston, West Va.
Kinney Iron Works ..... Los Angeles, Calif.
Koehring Company ..... Milwaukee, Wis.
Michigan Valve & Foundry Co. ..... Detroit, Mich.
Rosedale Foundry & Machine Co. ..... Pittsburgh, Pa.
Ross-Meehan Foundries ..... Chattanooga, Tenn.
Vulcan Foundry Company ..... Oakland, Calif.
Warren Foundry & Pipe Corporation ... Phillipsburg, N. J.
Washington Iron Works ..... Seattle, Washington



Carpenter

Selling Agents)

Washington Iron Works.....Seattle, Washington

him to INSURE the Results

Skillfully the tool maker sets his height gauge. With painstaking care he checks and rechecks every measurement.

Years of experience guide his every move—and pride of craftsmanship spurs him on to give you his best.

But tool making is a 50-50 proposition—and unless the tool steel works with him, "his best" is limited—and sometimes nullified by the behavior of the steel.

When you give him Carpenter Matched Tool Steels, you help him insure the results. Carpenter Acid Etch and Tough Timbre Tests permit only clean, sound, uniform steel to reach his hands. Torsion Impact Tests make available to him a fund of knowledge on the behavior of the steels and provide accurate heat treating data. The Matched Set Method simplifies his problem of selecting the right steel for each job. *All* of these advantages combine to insure *the results* which the tool maker has so carefully built into the die or tool.

To you, this means lower tool costs, fewer "headaches" and a definite increase in production. Carpenter Matched Tool Steels are quickly available from conveniently located warehouse stocks.

The Carpenter Steel Co., Reading, Penna.

This new handbook of modern practice for the tool maker, aids him in selecting the proper tool steel and the correct heat treatment to insure results. "Tool Steel Simplified" contains 315 pages—205 illustrations. Available from The Carpenter Steel Company at $1.00 per copy postpaid in U. S. A. (Elsewhere $3.50 per copy.)

The Standard Tool Steels of Industry

MATCHED TOOL STEELS

HELPING GOOD MECHANICS DO BETTER WORK

BY THE DEVELOPMENT OF 2 NEW TOOLS FOR SPECIAL TYPES OF JOBS

FOR drilling in awkward places—there's nothing like the new Black & Decker ¼-Inch Shorty Drill. Shorty requires only 4¼" clearance—its right-angle drive will reach "around corners"—and it has the same speed and power as a conventional ¼-Inch Drill.

The new ¼-Inch Low Speed Drill is specially designed for drilling in stainless steel, monel metal, high carbon and case-hardened steel. Its slower speed (450 r.p.m.) makes drilling easier, prevents burned drill bits and lost production time. Ask your Black & Decker Jobber to demonstrate these two new time-saving and money-saving tools—or write for complete details. The Black & Decker Mfg. Co., 716 Pennsylvania Avenue, Towson, Maryland.

Black & Decker

World's Largest Manufacturer of

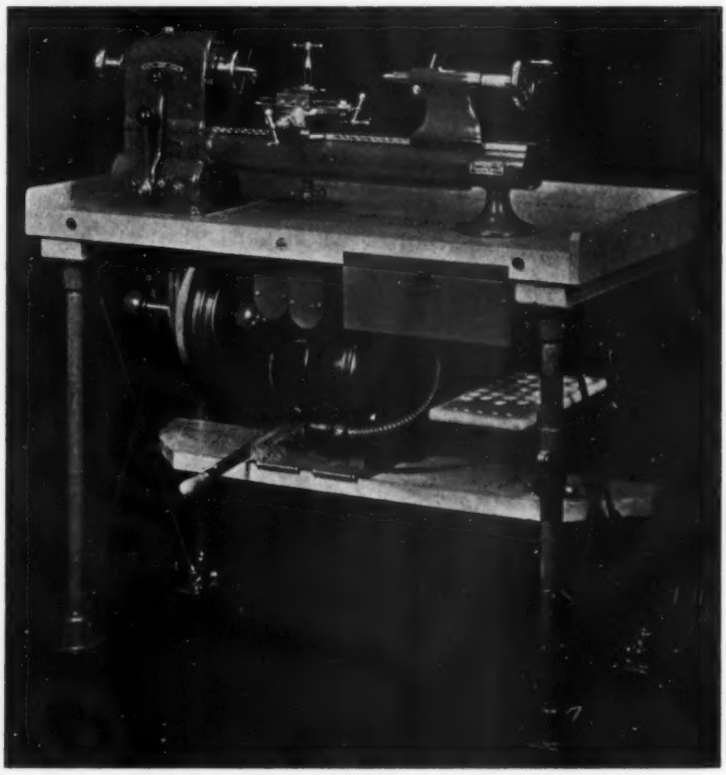
BLACK & DECKER

PORTABLE ELECTRIC TOOLS

Your TOOL MAKERS can do BETTER WORK FASTER

Every toolmaker takes pride and pleasure in turning out good work *quickly*—especially when provided with equipment that gives him every possible advantage and convenience.

Alert executives, everywhere, are now helping their toolmakers to *cut costs* by providing them with *Hardinge Precision Bench Lathes and Milling Machines.* Study the advantages listed below, and you'll easily understand why.



Hardinge "CATARACT" Ball-Bearing Precision Bench Lathe Unit.

HARDINGE "CATARACT" Enclosed-Head Ball-Bearing Precision Bench Lathe

Preloaded, duplex, double-row ball bearings in fully enclosed headstock, give extreme accuracy with positively no radial or end play. Turns perfectly true pieces. No adjusting of bearings—spindle not subject to bearing wear—permits use of modern tungsten carbide and diamond tools—produces excellent finish without polishing—modern electrical driving unit—high spindle speeds with six or eight speeds forward and reverse—brake for quick stopping of spindle—five sizes: ½" to 1" collet capacity, 7" or 9" swing—rigid construction, smooth performance and long life. Ask for Bulletin B3.

Hardinge "CATARACT" MD5 Precision Milling Machine.

HARDINGE "CATARACT" MD5 Precision Milling Machine

Enclosed headstock with connected bearings permits high spindle speeds with extreme accuracy—modern electric unit (enclosed in base) together with enclosed vee belt drive, gives six forward and six reverse spindle speeds.—Feed Screws revolve in long adjustable nuts and have friction dials graduated to thousandth of an inch. Compact dimensions save space and promote convenient operation. Longitudinal travel 12", Traverse travel 6½", Vertical travel 7½". Centers swing 6" diameter. Bulletin MD5 on request.

HARDINGE BROTHERS, INC.

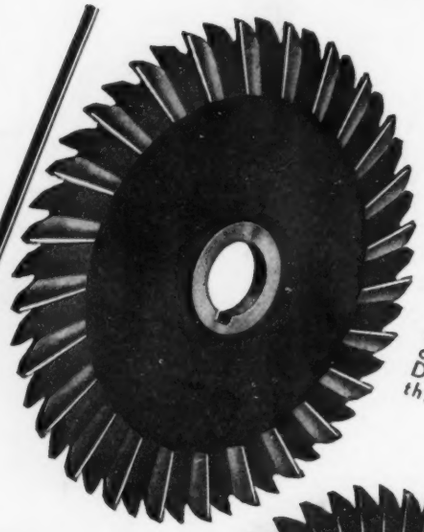
ELMIRA, N. Y.

CHICAGO—NEW YORK—HARTFORD—DETROIT—PHILADELPHIA

HARDINGE

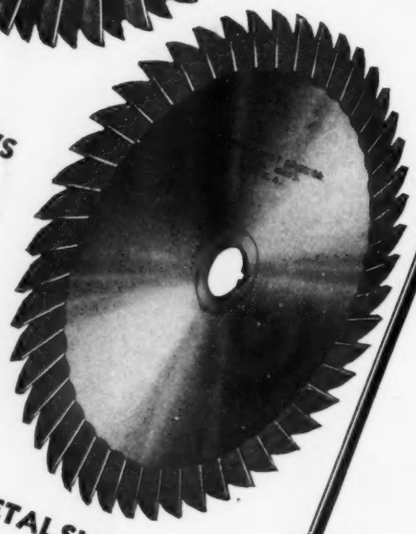
METAL SLITTING SAWS»

UNION



METAL SLITTING SAWS
WITH UNDERCUT STAGGERED SIDE TEETH
Side teeth do not cut but are for chip clearance. 3" to 8" Diameter, 3-16 to 1/4" thick. High Speed Steel.

METAL SLITTING SAWS
WITH SIDE TEETH
2½ to 8" Diameter, 1-16 to 3-16" thick. High Speed Steel.



METAL SLITTING SAWS
CONCAVE SIDES
2½ to 8" Diameter, 1-32 to 3-16" thick. Carbon and High Speed Steel

METAL SLITTING SAWS
WITH FORMED TEETH
Especially adapted for cutting copper and other materials of a tough, stringy nature. Sides are ground concave for clearance.

SCREW SLOTTING CUTTERS
HIGH SPEED STEEL
High Speed Steel Screw Slotting Cutters 2¾" diameter, 1" hole, are carried in stock with 44, 56 or 72 teeth; 2¾" diameter, ¾" hole, 72 teeth; 2¼" diameter, ⅝" hole, 60 teeth; and 1¾" diameter, ⅝" hole, 90 teeth.
High Speed Steel Screw Slotting Cutters are ground on the sides.

"The Tools You Buy Again"

Twist Drills, Milling Cutters, Side Milling Cutters, Gear Cutters, Hobs, Reamers, Taps, Dies, Screw Plates, etc.

New York: 61 Reade St. Chicago: 11 So. Clinton St.
Detroit: 6540 Antoine St. San Francisco: 121 Second St.
Los Angeles: 168 So. Central Ave.
S. W. CARD MFG. CO. DIVISION, Mansfield, Mass.,
BUTTERFIELD DIVISION, Derby Line, Vt., and Rock Island, Quebec. Representatives throughout the world.

UNION TWIST DRILL CO., ATHOL, MASS.

IT'S NEVER BEEN DONE BEFORE....

TURNING ANY LENGTH TAPER THAT THE LATHE TAKES BETWEEN CENTERS ... IN ONE SETTING OF THE TAPER ATTACHMENT!

THE first announcement of the new Monarch Anti-Friction Bearing Taper Attachment aroused widespread interest . . . and some skepticism. Never before had it been possible to turn accurate and smooth tapers under all conditions—to take heavy cuts at the most acute angles even up to 90 degrees included angle. Production Executives were frankly amazed at this Monarch development.

No longer is it necessary to reset the Taper Attachment, when turning long tapers, with the usual inaccuracy and marring of the work. All taper cuts made with the new Monarch Anti-Friction Bearing Taper Attachment (even to the full length capacity of the lathe) are continuously smooth and accurate . . . no matter how long . . . because such cuts are continued and uninterrupted.

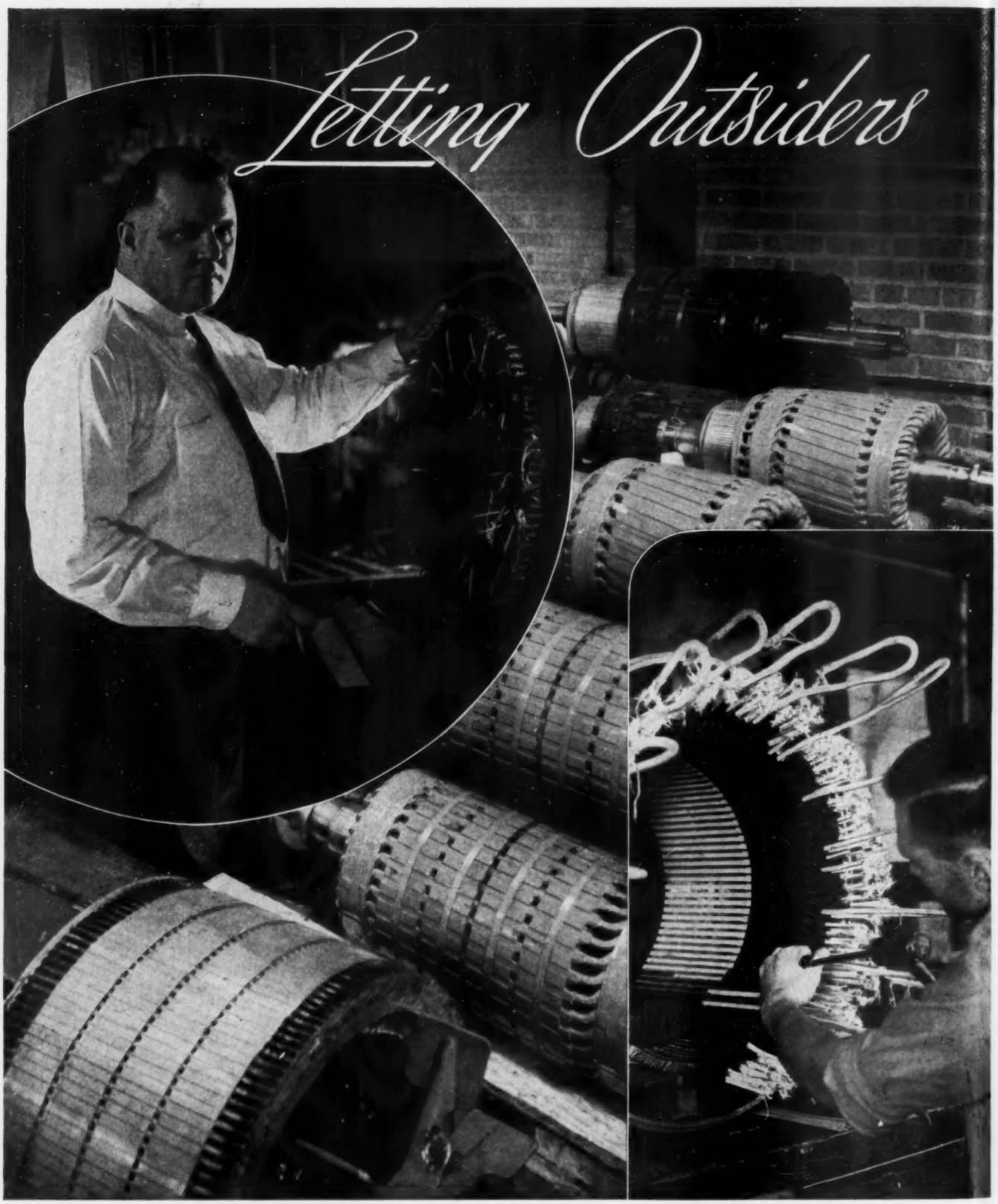
Monarch Products Include:
Engine Lathes . . . Tool Room Lathes . . . Special Manufacturing Lathes . . . Monarch-Keller Form Turning and Boring Lathes . . . The Monarch-Keller Magna-Matic Automatic Lathes . . . Model 5-T Lathe . . . High Speed Manufacturing Lathes . . . Hydraulic Multi-Speed Lathe.

THE MONARCH MACHINE TOOL CO., Sidney, Ohio, U.S.A.

MONARCH LATHES
COVER THE TURNING FIELD

Newark Sales Office: 1060 Broad Street • Chicago Sales Office: 622 West Washington Boulevard • Pittsburgh Sales Office: 604 Chamber of Commerce Building • Indianapolis Sales Office: 3115 Meridian Street.

MODERNIZE WITH MONARCH



Reliance business policies expressed in words would mean little without men like Bert Clough in the plant to make them alive. Associates and customers alike will testify that during Bert's 26 years at Reliance he has been known as an exponent of good workmanship and ready day and night to do his part in emergencies.

on the *Inside!*

Many of the visitors that Reliance salesmen bring to our Winding Department know a whale of a lot about motors. They have good eyes and can ask plenty of questions. I wouldn't want them around if we weren't doing a good job. They like to know about the material we use, where we put it, how much we use, etc. We are glad to show them because we are sure that we rate high on this score. « « « Another thing we are always anxious to show is the thoroughness of our insulation work, such as applying materials and impregnating in varnish and baking. « « « We like to have visitors, too, because we do so much particular work that's not apparent on the surface. The way you really find out how expertly this is done is to put the motor to work and see how well it sticks on the job. That's why we check up on ourselves regularly by following motors in unusual service. We often learn a great deal in the user's plant that helps us do things still better here.

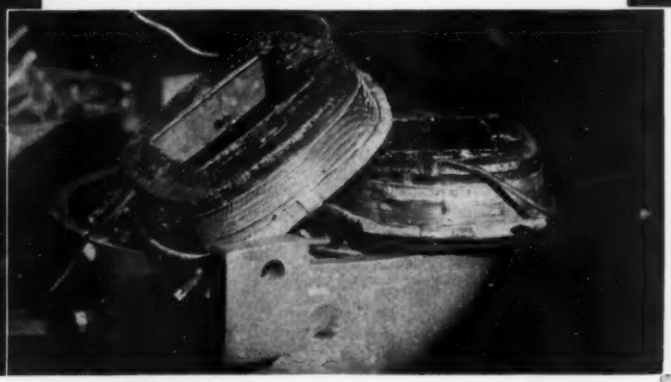
Bert E. Clough

Foreman of Winding Department,
RELIANCE ELECTRIC & ENGINEERING CO.

Left—Duraseal Insulation, a 4-time protection, is an example of what we mean by thoroughness. Stators with semi-enclosed slots go into the varnish tanks three times and get a 12-hour baking after each application. The final step is a spray-coat of orange-colored enamel. All this means longer life where there's dirt, moisture, oil, and so on.

★ ★ ★

Right – New uses and new methods of application have brought more and more exacting demands for quiet operation and improved running balance of electric motors. This Olsen-Lundgren Balancing Machine is used for balancing Reliance armatures and rotors. It indicates needed corrections so accurately that any special demands for smoothly running motors can be readily met.



Left – Constant improvement in field coils for d-c. Type "T" Reliance Motors has come about through the helpful cooperation of users. The bobbin-type construction shown here makes a substantial coil unit with excellent mechanical protection and ample insulation at all points. These coils receive four varnish treatments each followed by baking with a spray-coat of enamel after assembly in the frame.

RELIANCE A-C D-C MOTORS

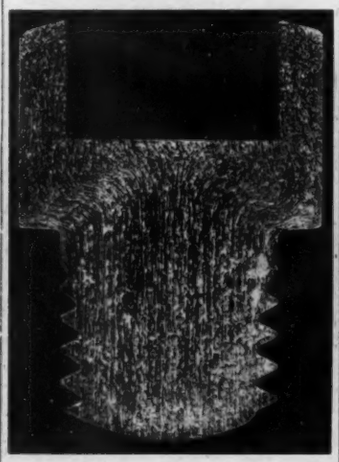
Reliance Electric & Engineering Co.
1088 Ivanhoe Road, Cleveland, Ohio
Branches: Birmingham, Boston, Buffalo, Chicago, Cincinnati, Detroit, Greenville (S.C.), New York, Philadelphia, Pittsburgh
Representatives in other principal cities

TWO YEARS RESEARCH BACK

Superior Cold-Forging Process Replaces Milling From Bar Stock

25 YEARS EXPERIENCE IN COLD-FORGING GIVES PARKER-KALON AN ADVANTAGE

It is an accepted fact that forging adds strength to steel—and strength is one of the essential requirements in Socket Screws. That is why Parker-Kalon decided in favor of cold-forging their Socket Head Cap Screws, Socket Set Screws and Socket Head Stripper Bolts instead of milling them from the bar. The cold-forging process provides against head breakage and other structural failures by retaining the fibrous structure of the steel and obtaining a concentration of metal at all points subject to strains.



Cold-forging retains unbroken fibrous structure and increases strength at points subjected to greatest stresses. Note also flat base socket—wrench seats to bottom.

Scientific Heat Treatment Assures Unvarying Uniformity

Uniformity of the physical and metallurgical characteristics of Parker-Kalon Socket Screws can be definitely depended upon because every size and type is put through an individual laboratory-controlled routine of heat treatment.

NEW COLD-FORGED SOCKET SCREWS ACCEPTED ON MAKER'S REPUTATION

Industry Welcomes Latest Parker-Kalon Product

"Amazed at Wonderful Reception" . . . Salesman for Large Philadelphia Distributor Reports

Leading mill supply distributors and hardware jobbers all over the country who have already begun to introduce Parker-Kalon Cold-forged Socket Screws report that their customers accept them without question or hesitation. Engineers and shop men take the quality of these new products for granted, knowing Parker-Kalon's reputation for producing screw products of the highest quality.

One Philadelphia jobber's salesman, after soliciting business for Parker-Kalon Socket Screws, writes: "I was frankly amazed at the wonderful reception which your product received and am greatly impressed with the attitude of the larger screw users, which is: If the product is made by Parker-Kalon, it must be O.K."

New Products To Be Sold Through Recognized Distributors

The new Parker-Kalon Cold-forged Socket Screws will be sold through recognized distributors all over the country consistent with the maker's long established policy based on the confirmed belief that —"distributors serve industry economically".

favor of cold-forging their Socket Head Cap Screws, Socket Set

Get Samples - Compare

CLIP THIS COUPON TO YOUR LETTERHEAD

PARKER-KALON CORPORATION
200 Varick St., New York

Please send samples as checked:

Socket Set Screws ☐
Socket Head Cap Screws ☐
Socket Head Stripper Bolts ☐

PARKER-KALON

OF NEW SOCKET SCREWS

LABORATORY PLAYS IMPORTANT PART

The Parker-Kalon Mechanical and Metallurgical Laboratory is a constant safeguard of the quality of Parker-Kalon Modern Fastening Devices.

$250,000 SPENT FOR LABORATORY EXPANSION

Parker-Kalon Equipment for Research, Development and Control of Quality Has No Counterpart in Screw Industry

It was obvious to Parker-Kalon that in order to produce Socket Screws of exceptional merit, it was absolutely necessary to have complete facilities for determining the good qualities as well as any shortcomings of the Socket Screws already on the market because only with that knowledge could they turn out a product that would embody only the good characteristics of the others.

They saw, too, that it was equally important to provide the most modern equipment as well as a highly trained personnel to maintain the standard of quality which this research would establish.

These very practical reasons explain why Parker-Kalon invested more than a quarter million dollars to expand the facilities of the Parker-Kalon Mechanical and Metallurgical Laboratory. Every modern scientific aid was provided for the determination and control of all physical and metallurgical characteristics which the uses of Socket Screws demand.

Editors of leading industrial publications who have seen these facilities proclaim them as having no counterpart in the screw industry.

DETECTS VARIATION OF 1 1,000,000 OF AN INCH

This amazing instrument developed and built in the Parker-Kalon Laboratory checks gauge blocks used to maintain the accuracy of all production gauges. It is sensitive to variations as minute as one millionth of an inch, and gives direct readings.

Parker-Kalon Announcement Ends Speculation About Its New Product

RESULTS JUSTIFY LARGE EXPENDITURE OF EFFORT AND MONEY

This month the attention of the metal working industry will be focused on the Socket Screws developed by Parker-Kalon Corporation who, while new in this particular branch of screw manufacture, has for years been recognized as a leader in the fastening device field.

Formal announcement of the new line of products ends the interested speculation concerning them which began when it became known that Parker-Kalon was preparing to enter the Socket Screw field and would offer a product of exceptional merit. Much was expected of this concern because of the ingenuity it has frequently exhibited in producing meritorious fastening devices, among which are the now famous Parker-Kalon Hardened Self-tapping Screws. It was a commonly expressed opinion that if Socket Screws could be improved, Parker-Kalon would be likely to improve them.

Task Took Over Two Years

An executive of Parker-Kalon, describing the effort put into the new products, makes it clear that the Company took a big job upon itself when it decided to enter the Socket Screw field. He states: "It took well over two years of intensive research and development work to produce Socket Screws good enough to uphold our reputation. We had to do more than produce a 'good' product because good ones were already on the market.

"In reviewing the work it seems that the biggest advantage we had was the ability to begin at the beginning, without preconceived ideas or existing equipment. We could, and did, take full advantage of the many modern developments in metallurgy and in the mechanical arts.

Spent Fortune In Laboratory

"We spared no expense to accomplish the result we were after. A good example of that is found in the Parker-Kalon Mechanical and Metallurgical Laboratory where we invested a sizable fortune for the additional facilities necessary to develop Socket Screws of the highest quality; and to maintain that standard in production."

Details and Samples

Parker-Kalon has concisely covered the details of their new Socket Screws in an illustrated bulletin which is offered to users of Socket Head Cap Screws, Socket Set Screws and Socket Head Stripper Bolts. This bulletin together with samples of the new products for inspection and test will be sent upon request.

QUALITY SAFEGUARDED

From the rod to the finished product Parker-Kalon Cold-forged Socket Screws must pass 28 metallurgical and physical inspections.

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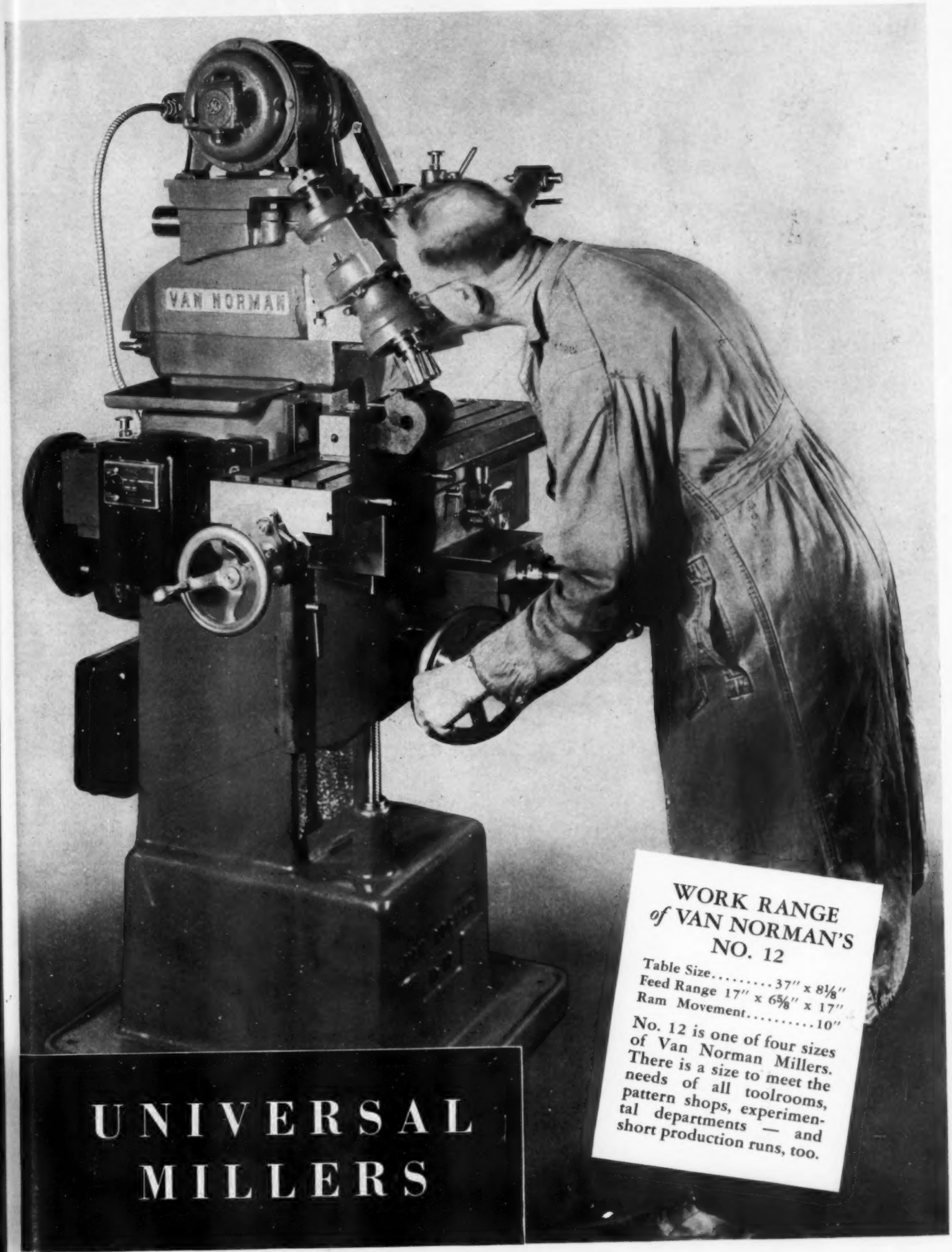
Cold-forged **SOCKET SCREWS**

ONE HEAD IS BETTER THAN TWO . . .

when it's the swiveling cutterhead of a Van Norman Universal Miller. For it does the work that usually calls for attachments on vertical or horizontal machines. The set-up stands till the job is done. The cutterhead swings to any position from horizontal to vertical, and the sliding ram moves it quickly to either side of the job. This saves half the time and *all the errors* involved in frequent resetting. And there's far less indicating work to do . . . no fussy adjustments of fixtures or angle-plates. All four sizes of Van Norman Millers are rigid, fast and accurate on the heaviest cuts. For illustrated bulletins and specifications, write to Van Norman Machine Tool Company, Springfield, Massachusetts.

VAN NORMAN



UNIVERSAL MILLERS

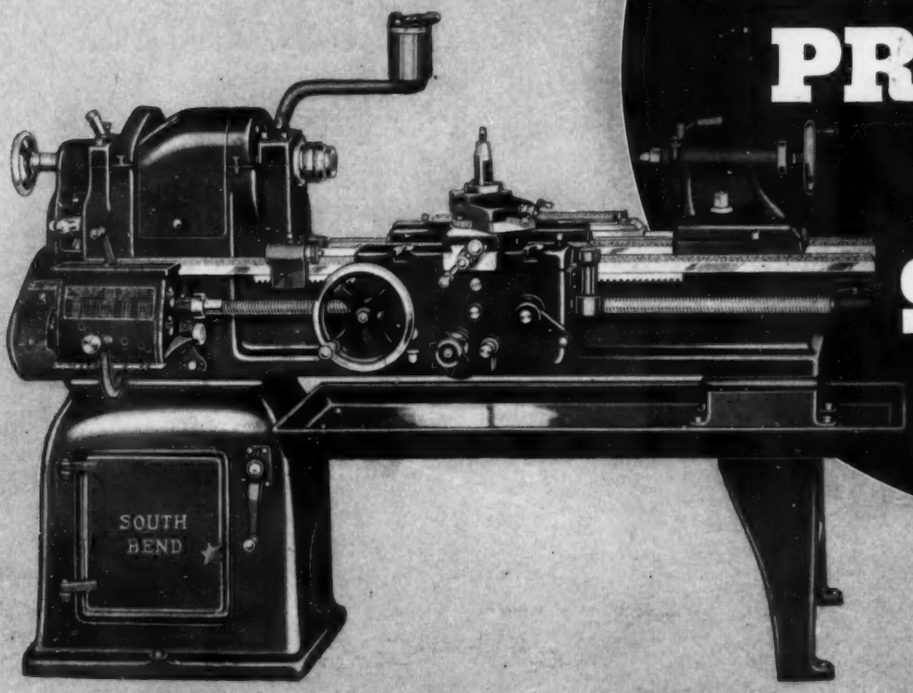
WORK RANGE *of* VAN NORMAN'S NO. 12

Table Size.....37″ x 8¼″
Feed Range 17″ x 6⅝″ x 17″
Ram Movement.....10″

No. 12 is one of four sizes of Van Norman Millers. There is a size to meet the needs of all toolrooms, pattern shops, experimental departments — and short production runs, too.

Invest IN PRECISION PLUS SPEED

Precision plus speed is the watchword of today's machine tool design. This South Bend Lathe is a typical example.



Modern machine tools offer BOTH ... and thereby provide your best insurance against rising prices and production costs.

Precision in production is the only sure road to a quality product, increasing sales, and valuable customer good will.

But just as certain, and just as pressing is today's demand for production SPEED. Economic forces have combined to drive costs and prices upward. Increased efficiency is the one certain way to combat their upward push.

Manufacturers of lathes and modern machine tools are meeting this double demand with typical ingenuity and despatch. Investigate the possibilities of their latest designs for reducing costs in your own plant. You'll find that investment in modern machine tools assures *both* precision and speed . . . that their cost is the best insurance for profitable operation you could have.

And remember when you buy, that the electric drive is a vitally important element in the benefits of the machine. To be certain of dependable low-cost operation specify motors, control, "De-ion" breakers, and auxiliary equipment by Westinghouse. J 20377

Westinghouse Electric & Mfg. Co.,
East Pittsburgh, Pa.

Complete DRIVE FOR MACHINE TOOLS . . .

CS (A-C.) MOTORS—Rigid One-Piece Frame won't sag from overhung loads; Dual-Protected Windings resist oil, moisture, metal chips; Sealed Sleeve Bearings keep clean oil in, dust, dirt and grit out.

SK (D-C.) MOTORS—Rolled steel frame provides uniform magnetic circuit; commutation that stands up under peaks and overloads; long brush life; Sealed Sleeve Bearings.

FRACTIONAL HP. MOTORS—Types FS and FK are particularly suitable for small tools, rapid traverse, clamping and feed operations; coolant and lubricant pumps. They have Rigid Steel Frames and heavy cast Brackets assuring permanent alignment.

GEARMOTORS—Reduce space ½ to ⅔. Designed, built and teated as a unit to assure reliable operation. Simple, sturdy design.

TYPE WK MANUAL MOTOR STARTERS—Are economical, compact, reliable for motors up to 7½ hp.

NEW "DE-ION" CONTACTORS AND LINE-STARTERS—Arc fully confined in "De-ion" arc quencher. Compact. Ideal for built-in applications.

A GOOD MACHINE IS WORTHY OF A GOOD DRIVE —

WESTINGHOUSE ELECTRIC

Specify **Westinghouse**

The 18 Spindle Speeds of the P&W Model "C" Lathe are in

GEOMETRICAL PROGRESSION

Here, in graphical form, is the reason why you always have available the *right* spindle speed for a job on the P&W Model "C" Lathe. These eighteen speeds are arranged in geometrical progression, with no large gaps. This means that the next lower or higher speed is not a big jump away, but near enough so you can turn every job at full cutting efficiency.

It is easy to figure out theoretical speeds in geometrical progression, the acknowledged ideal arrangement, but it is quite different to find reasonable gearing to actually produce these speeds. In the Model "C" Lathe the greatest variation from the theoretical speed is only 1¼%, a real engineering accomplishment! The curve on this page shows the actual spindle speeds available.

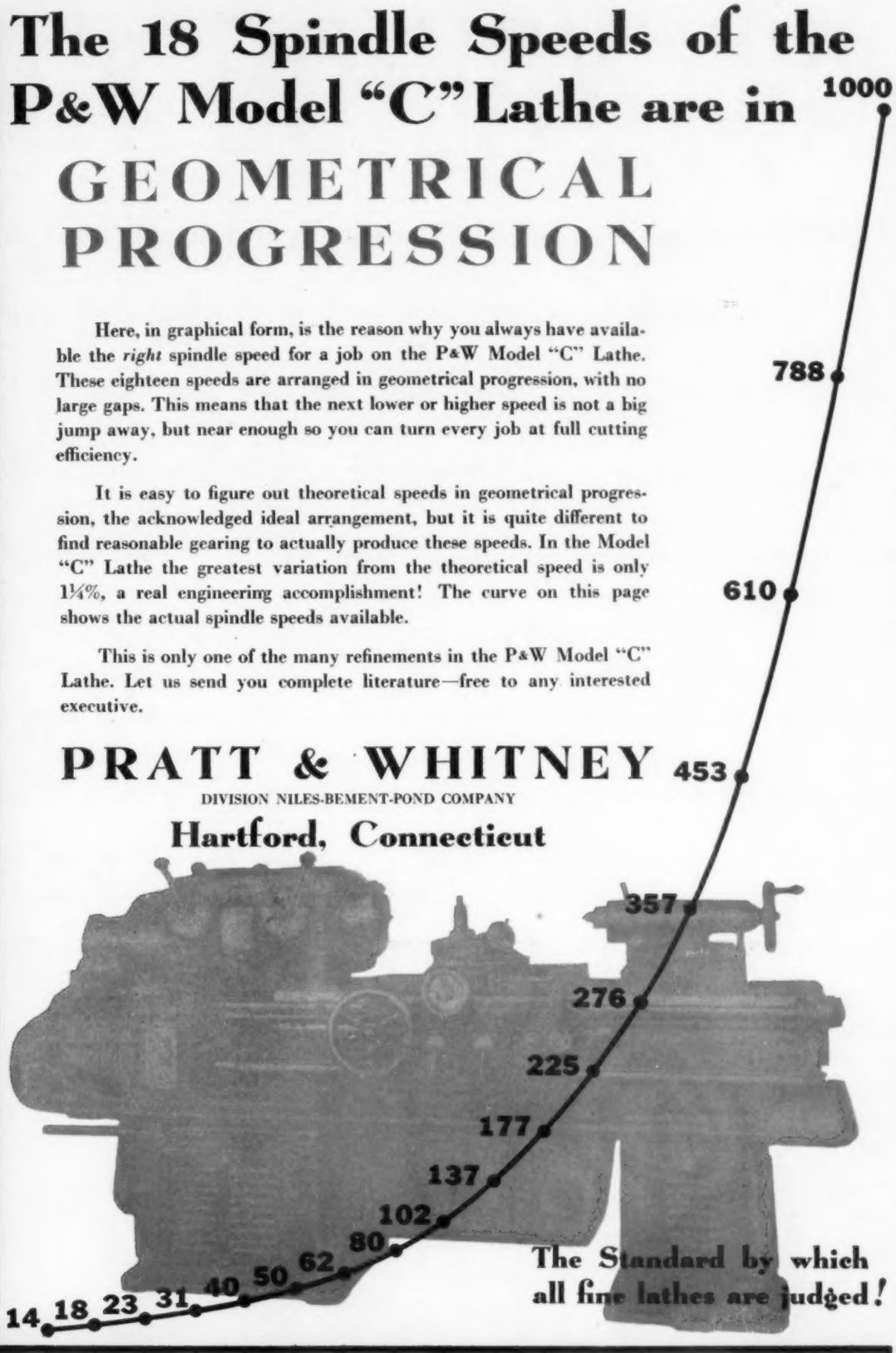
This is only one of the many refinements in the P&W Model "C" Lathe. Let us send you complete literature—free to any interested executive.

PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY

Hartford, Connecticut

The Standard by which all fine lathes are judged!

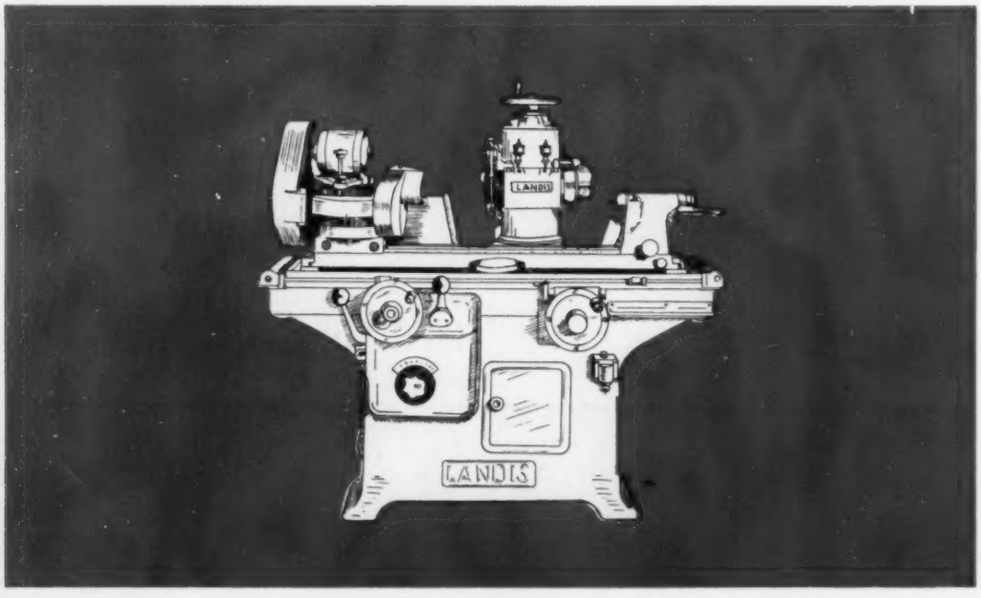


PRATT & WHITNEY

WILL YOU DO YOUR

THE above heading may strike you as being odd, but we mean just that. Here's why ● Some months ago the Landis Tool Company announced a new 12" x 28" Universal and Tool Grinder. Many are now in use. Our original feeling that the machine would quickly prove itself has been justified ● Being practical, you want to know what this machine will do for you. Realizing this, we have just issued a catalog crammed full of the "what and how" type of information. There are twenty-four pages of it with dozens of word-saving illustrations ● We cannot possibly tell you on these pages of the many grinding

LANDIS TOOL COMPANY



SELF A FAVOR?

operations the machine will efficiently perform in the tool room. Hob grinding, circular forming tool grinding, staggered tooth gear cutter grinding, internal grinding, surface grinding, radial grinding, cutter and reamer grinding, and so on and so on. Nor have we the space to explain the features of design and why they make the 12" x 28" so popular with operators ● Do yourself the favor of learning these things by sending for the catalog. Ask for No. K-137. We've made it easy—simply fill in and mail the coupon below. You'll be as enthusiastic about the Landis 12" x 28" as we are, after you've seen it saving valuable minutes in your own tool room. 257

WAYNESBORO, PENNSYLVANIA

O.K.

You may send catalog No. K-137 which describes the Landis 12" x 28" Universal and Tool Grinder.

Name _____ Title _____

Company _____

Address _____

BOTH ARE INDISPENSABLE

POWER

RANGE

Every correctly designed bolted assembly *must* include *Helical* Spring Washers . . . *adequate both in range and power* to keep parts *tight.*

SPRING WASHER INDUSTRY

616 WRIGLEY BLDG., CHICAGO, ILL.

ONLY A HELICAL SPRING WASHER HAS ADEQUATE RANGE OF *Live Action*

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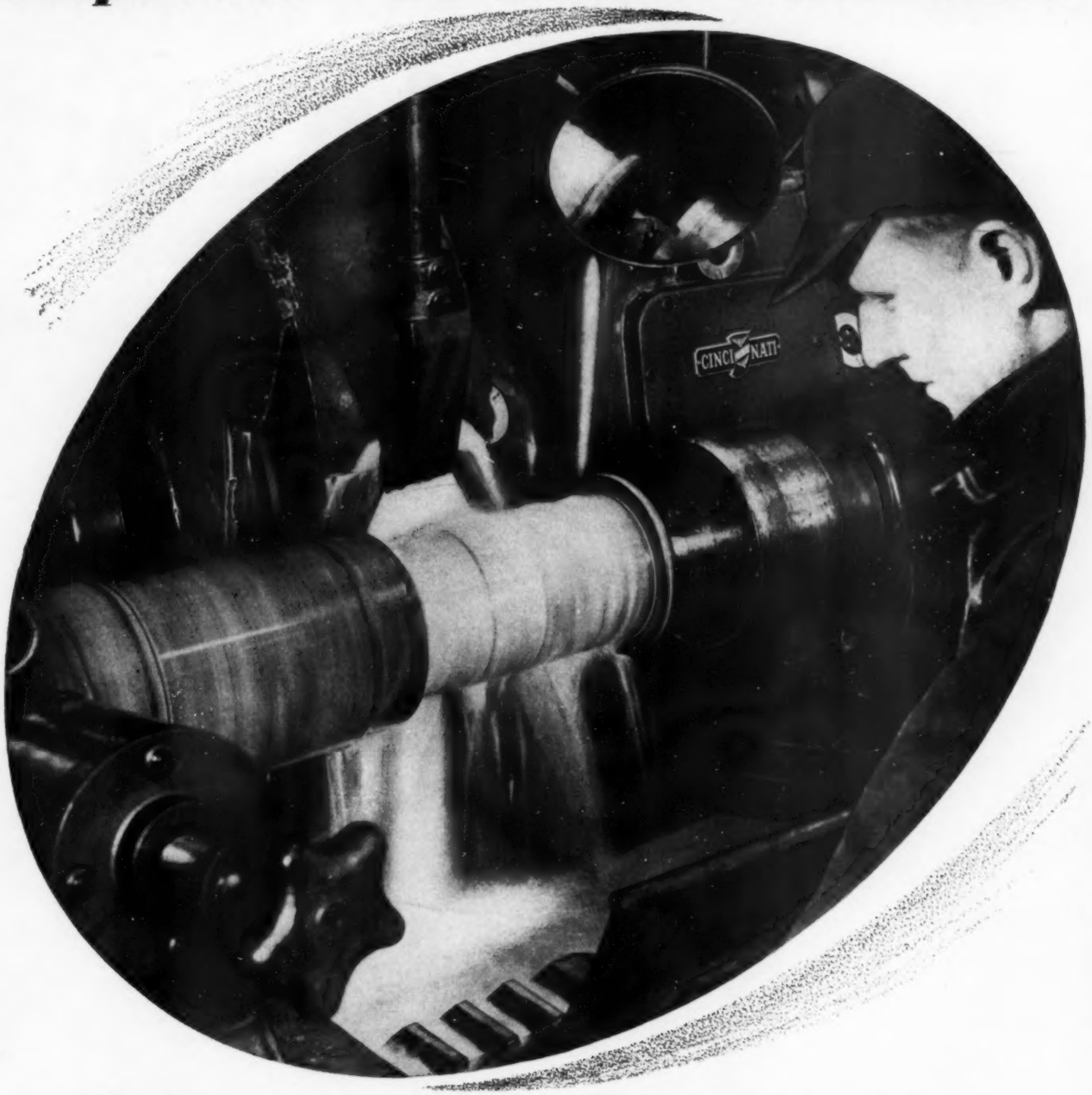

IN CYLINDRICAL grinding operations, Bakelite Resinoid bonded wheels not only speed-up output, but also produce finer, more accurate surfaces, with less wheel-dressing. On other types of grinding, as well, the great strength, uniformity and heat resistance of these wheels afford economy and safety, even at speeds up to 16,000 s. f. p. m. Write for instructive booklet 14G, "High Speed Abrasive Wheels."

BAKELITE CORPORATION, 247 PARK AVENUE, NEW YORK, N.Y.
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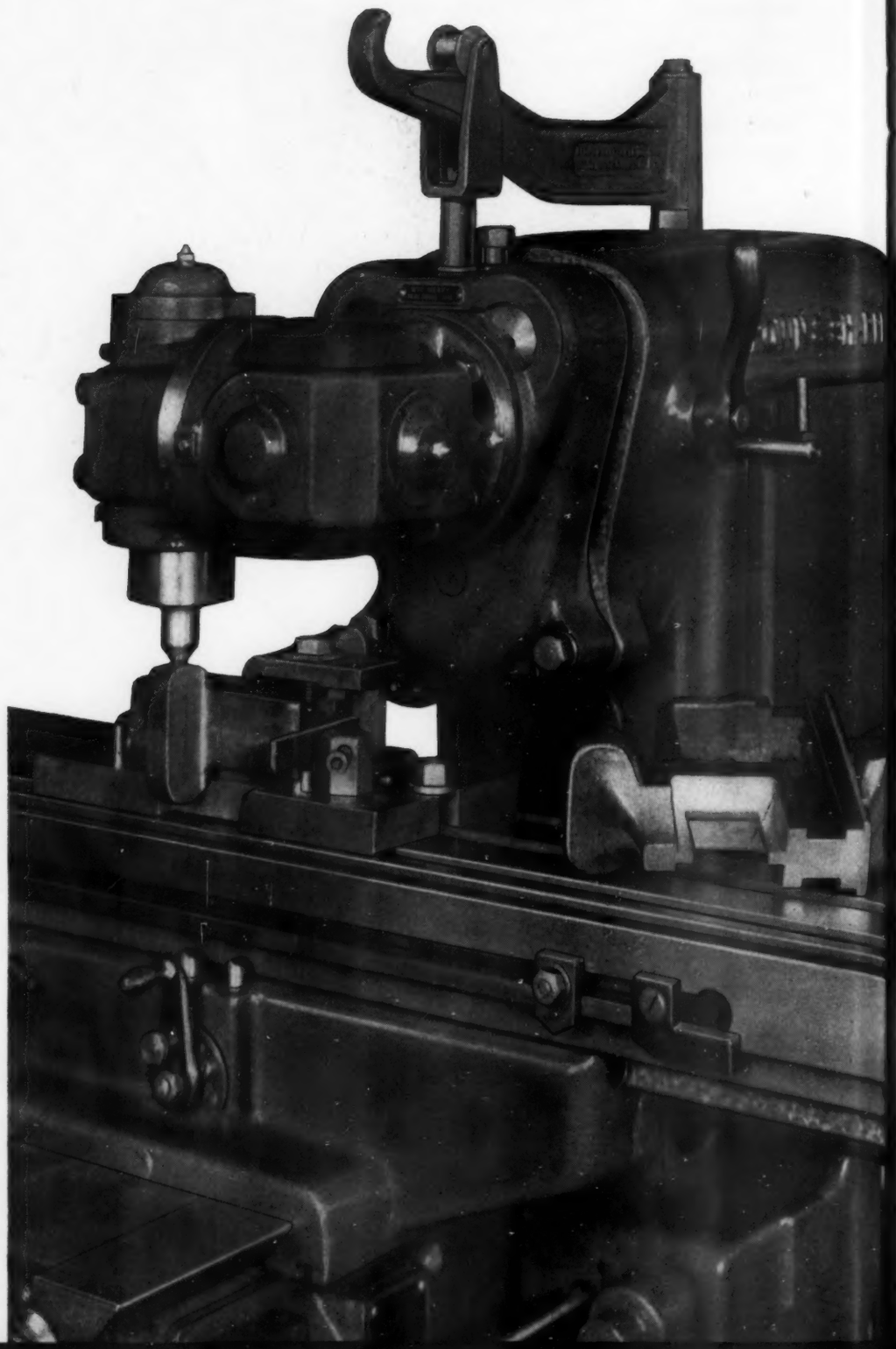
BONDED WHEELS

FOR ECONOMICAL HIGH SPEED GRINDING

A Profitable Advantage of



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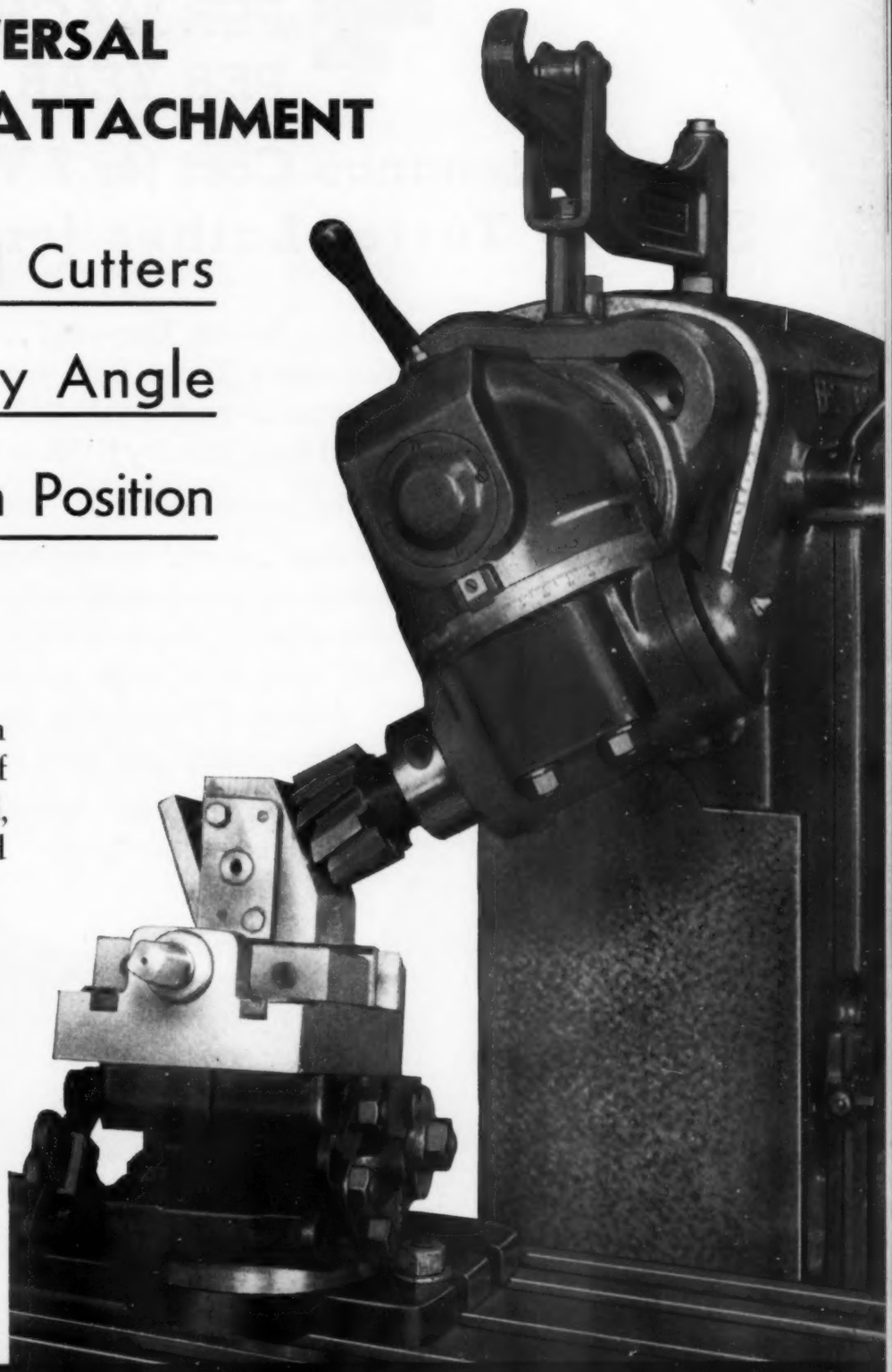
Settings to Any Angle

*Easy to Place in Position



*Simply by swinging from storage position at side of machine with crane, and, clamping to column and overarms.

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$4.09 PER MACHINE PER YEAR

...maintenance Cost for 7 Warner & Swasey Turret Lathes for 6 Years

In the Baltimore plant of the Bartlett Hayward Division of Koppers Company, seven Warner & Swasey Turret Lathes are in service. An accurate report shows a maintenance cost of only $171.72 for these seven machines for the six year period from January 1, 1931 to December 31, 1936.

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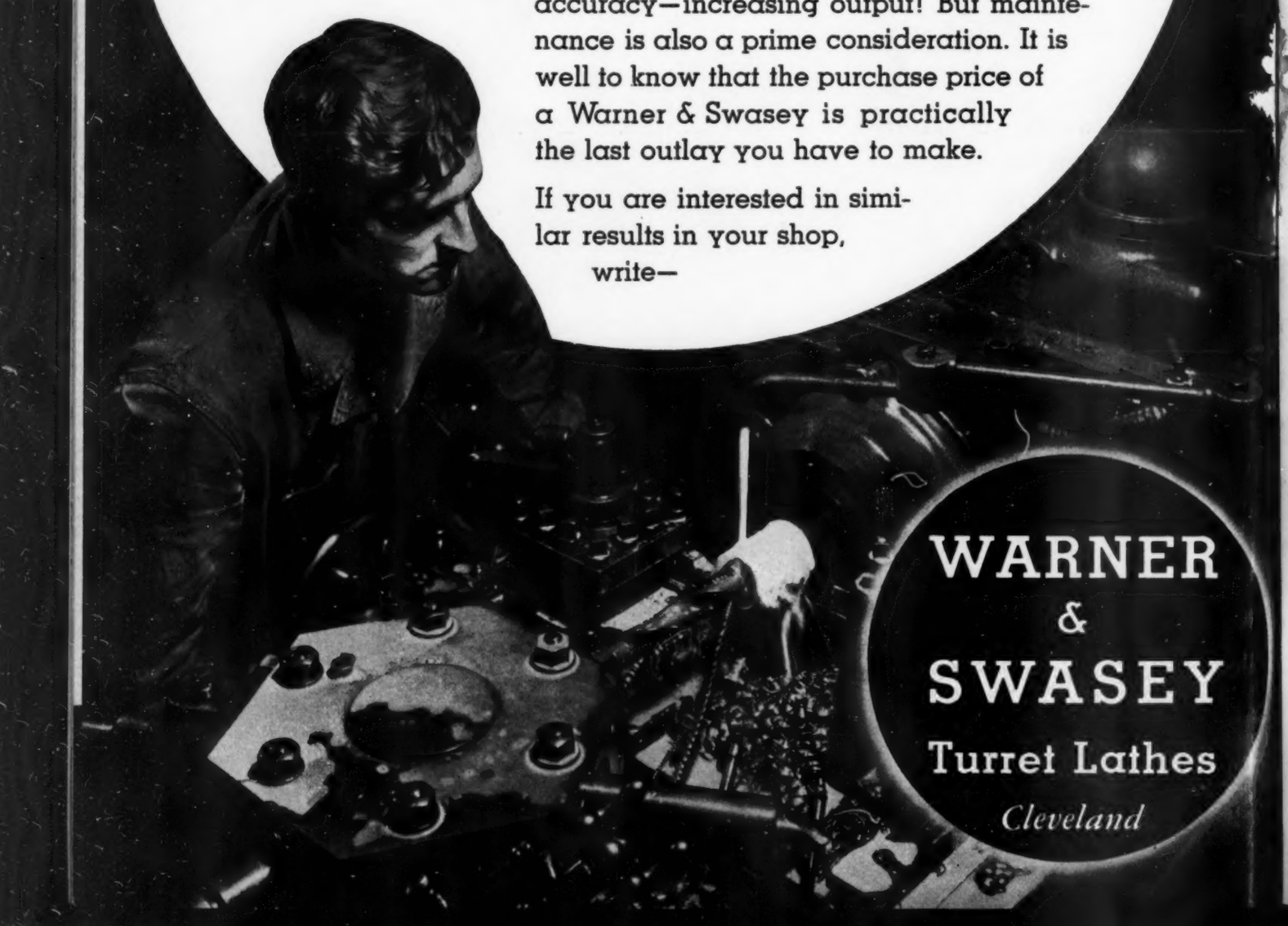


WARNER & SWASEY
Turret Lathes
Cleveland

EDITORIAL

The 1937 Metal Congress

DURING THE nineteen years of its existence, the National Metal Congress has firmly entrenched itself as a useful adjunct of American industry. Its life span has covered a period of unparalleled progress in the development of improved metals and methods for processing them.

The Metal Congress has made a positive contribution to this progress through the exchange of ideas at its technical sessions and through the Exposition of new materials and equipment that has become an attractive and informative part of the proceedings. Growing each year because of these forward steps, the Congress has won a secure position as a meeting place for metallurgists and practical metal workers.

Today the American Welding Society, the Machine Shop Practice Division of the A.S.M.E., the Metals Divisions of the A.I.M.M.E., and the Wire Association join with the American Society of Metals to swell the number of interesting technical sessions and the attendance at each one. This is commendable cooperation between technical societies.

Originally based on a need for fuller knowledge of the heat-treatment of steel, the annual meetings have traced industrial progress in this direction and in addition have broadened their scope to include other metals and other processing methods designed to develop characteristics best suited to meet the demand for exacting engineering requirements. Thus the Congress that lies just ahead will include, besides heat-treating, such operations as welding, testing, cleaning, plating, finishing and many displays of the new equipment available for performing these functions.

TO THIS clearing house of metallurgical knowledge, this number of *American Machinist* is devoted. The pages that follow contain programs of the technical sessions of the sponsoring societies, a list of Metal Show exhibitors, a preview of some of the newer developments in equipment and materials, and a series of articles describing specific applications in this field. Those of our readers who are able to attend the meetings and view the displays at Atlantic City should gain added value from their visit through the accounts given here. Those who cannot be present will secure as many of the benefits of this event as can be passed along through the medium of the printed word.

VOLUME 81 • AMERICAN MACHINIST, ESTABLISHED 1877 • K. H. CONDIT, F. H. COLVIN, EDITORS • NUMBER 20

1937 Progress In the Metal Industry

Trends of the year indicate that there is less "lag" between the time of scientific and technical discoveries and the time of their adoption

EDGAR C. BAIN
President, American Society for Metals

A SURVEY of trends in the metal industry could more accurately be made after the National Metal Congress and Exposition, October 18 to 22, for many new developments come to light at this annual event. A preview is impossible, but one may consider in what directions progress is seemingly taking us. With the very considerable aid of the editorial office of the American Society for Metals, some observations are presented here — probably with misplaced emphasis and omissions which unintentionally result from the myopia of a restricted viewpoint.

EDGAR C. BAIN

Beginning with the material of greatest tonnage—low carbon steel —the recent construction of modern continuous sheet mills has resulted in an improved quality of goods, the increased production of which is absorbed not only in automobile bodies, refrigerators and similar large press work, but in innumerable small stamped parts, covers, guards, frames, etc., in small machines and in toys. This trend amounts to a moderate but fundamental revolution in small-part stamping.

Copper, a second staple metal, has, with its numerous alloys, enjoyed an advance in application. New applications are well met with such alloys as the silicon bronzes. Copper and its alloys retain their prime position as metals for condenser and radiators, and for the new alloys, new methods of fabrication have extended their use.

The third staple metal, aluminum, continues to be vigorously and successfully promoted. Sound development continues to bring out improved alloys each for a specific field, while manufacturing processes have kept pace in handling the strong aluminum alloys, some for casting, others for forging, and still others for rolled products. The still lighter sister metal, magnesium, is being increasingly utilized for parts wherein weight is, above all, the criterion. Die castings are gaining in popularity for household equipment and many necessarily portable machines. Aluminum, and secondarily, magnesium, maintain a dominant position in aircraft. As airplanes are built larger, steel becomes increasingly competitive and in many cases corrosion may become an increasingly important factor.

The tempo of the scientific, or fundamental study of metals seems to be once more stepped up, with an even greater speed of utilization of new knowledge in industry. The body of exact knowledge about metals is becoming greater and in better order. Not only is the old art of hardening steel now better understood and simplified, but hardening (broadly) is almost universally applicable to all metals. The hardening of copper, aluminum, monel, magnesium and even lead is now commonplace and responsible for considerable new industrial consumption.

Other important products of science, applied to metallurgy, are the improved, or controlled, plain

carbon and alloy steels. Long ago users of tool steel were aware of differences in quality, sometimes called "body," not reflected in analysis. We now know that the grain size at hardening temperature profoundly affects depth of hardening and toughness of the hardened zone. More important, grain growth characteristics can be controlled and matched to the composition for best final properties in tools and machinery. Grain size control is now applied to large tonnages of low carbon, medium and high carbon steels as well as to low alloy steels with immeasurable benefit. Carbon steels or lower alloy steels, thus controlled, sometimes replace more expensive steels and meet exacting requirements.

The *common* alloying elements are now more fully utilized up to known, rather than supposed, limits. Manganese, silicon, copper, chromium, phosphorus, as well as nickel and molybdenum, are judiciously used in the high strength structural steels which, though regular open-hearth steels, have properties between those of conventional alloy steels and carbon steel. Corrosion resistance is definitely improved in some of these, enabling full advantage to be taken of the strength in reducing sections and saving weight.

Satisfactory high speed cutting tools have been developed in which much of the tungsten has been displaced by molybdenum. From the standpoint of wartime shortages, this might prove of first magnitude importance, since the domestic sources of molybdenum are almost unlimited. This element, a carbide former, is being utilized in large total amounts as a relatively small addition to carbon steel. These steels retain fine grain to temperatures definitely above those ordinarily used for carbon steels, and have the attendant advantages in gears, springs, etc. Somewhat higher proportions are utilized with or without other elements in high pressure piping and vessels for service at elevated temperatures because of the higher creep resistance imparted.

Wanted: Stainless Steel

Available capacity for the production of stainless steel has been occupied, not so much with new steels, as with meeting the expanding demand for familiar alloys in sheet, strip, and thin plate from which are manufactured articles of varied use wherein their permanence of inert surface is desired. Reliance is justified in the stabilized alloys and in other modifications. Tonnages and quality of high chromium castings for high temperature service continue to advance, a notable use being for furnace tubing in which gas is burned, the tubing thus becoming a radiator for heating furnace and work. The same qualities in castings are demanded in the various devices which convey the work through the furnace. The furnaces themselves have grown to extraordinary size and probably offer marked extension of service life. Strict functional design and lavish control accessories combine, with refractories, to merit most favorable comment in modern furnace building.

A significant trend is the widening use of special atmospheres in these furnaces, in which low carbon steel and copper remain substantially unaffected, thus eliminating much subsequent surface cleaning. Bright annealing continues to be developed. The problem of hardening steel with neither a decarburized nor a scaled surface is more difficult, but praiseworthy approximate solutions have been developed. Intentional deep carburization by a gaseous atmosphere is now a familiar commercial practice.

Instruments are becoming more rugged internally and exquisitely encased for maximum convenience and protection. The control of atmospheres and of temperatures has posed many new problems, but rapid changes in temperature are now almost instantly recorded. Photo-electric cells and electron tubes are replacing mechanical movements and relays in some instruments. Open-hearth control by automatic roof temperature inspection gains headway.

Among fabrication processes the art of welding merits attention. Its official recognition in building construction by municipal code in New York City serves to stimulate the application of welding elsewhere. Improvements in quality of the joint have been achieved with an actual increased speed of work; in the case of gas welding, multiple flame heads speed up the work; in arc welding a bare electrode can deposit sound metal at an unprecedented rate when submerged in a mass of non-conducting powder which later becomes conducting when molten; in resistance welding the *precise* control of energy has extended the field to aluminum and thicker steel sections. Finally, improved equipment and technique have made possible "flame machining," in which surfaces at various angles, and even curves, are expeditiously cut, to say nothing of the rapid removal of thin surface layers of metal. Thermit welding continues to fill the needs of characteristically difficult and unusual applications.

The broad trend in metals, one might say, is the utilization of technical developments with a diminished time lag, and the broad commercial fulfillment of the promise in previous scientific advances.

G. B. WATERHOUSE, *President-Elect*
American Society for Metals

Nineteenth

American Society for Metals

Monday, October 18

10:00 a.m.—Ambassador Hotel

THE PROCESS OF DRY CYANIDING. R. J. Cowan and J. T. Bryce, Surface Combustion Corp.

THE MECHANISM OF STEEL HARDENING AND TEMPERING AS INDICATED BY COERCIVE FORCE MEASUREMENTS. R. S. Dean, Bureau of Mines, and C. Y. Clayton, Missouri School of Mines and Metallurgy.

EFFECT OF TEMPERING QUENCHED HYPEREUTECTOID STEELS ON THE PHYSICAL PROPERTIES AND MICROSTRUCTURE. C. R. Austin and B. S. Norris, Pennsylvania State College.

2:00 p.m.—Auditorium Ball Room

EFFECT OF CARBON ON THE HARDENABILITY OF HIGH PURITY IRON-CARBON ALLOYS. T. G. Digges, National Bureau of Standards.

PRECIPATION-HARDENING OF COBALT STEEL; A NEW TOOL MATERIAL. R. H. Harrington, General Electric Co.

QUANTITATIVE HARDENABILITY. J. L. Burns, T. L. Moore and R. S. Archer, Republic Steel Corp.

Simultaneous Session, Auditorium—Room B

A NOTE ON RAPID PHOTOMICROGRAPHY. W. Mutchler and H. O. Willier, National Bureau of Standards.

THE EFFECT OF GRAIN SIZE ON THE OXIDATION OF A LOW CARBON STEEL. C. A. Siebert and Clair Upthegrove, University of Michigan.

ELECTROMAGNETIC MEASUREMENTS AND STEEL STRUCTURES CORRELATED. Carl Kinsley, Consulting Engineer, New York.

4:30 p.m.—Auditorium

STEEL MAKING. Earnshaw Cook. American Brake Shoe & Foundry Co.

8:00 p.m.—Auditorium

METALLOGRAPHIC TECHNIQUE. J. R. Vilella, United States Steel Corp.

Tuesday, October 19

10:00 a.m.—Ambassador Hotel

THE RUPTURE STRENGTH OF STEELS AT ELEVATED TEMPERATURES. A. E. White and C. L. Clark, University of Michigan, and R. L. Wilson, Timken Roller Bearing Co.

THE HEAT-TREATMENT OF HIGH-SPEED STEEL IN SALT BATHS. Axel Hultgren, Consulting Metallurgist, Stockholm, Sweden.

A NEW APPLICATION FOR THE SHORT-TIME HIGH TEMPERATURE TENSILE TEST. C. L. Clark, A. E. White and C. J. Guarnieri, University of Michigan.

2:00 p.m.—Auditorium Ball Room

AUSTENITIC GRAIN SIZE OF EUTECTOID STEEL. Harry Tobin and R. L. Kenyon, American Rolling Mill Co.

SOME FACTORS INFLUENCING AUSTENITIC GRAIN SIZE IN HIGH PURITY STEELS. G. Derge and R. F. Mehl, Carnegie Institute of Technology, and A. R. Kommel, United Engineering & Foundry Co.

RELATION OF PRE-TREATMENT OF STEELS TO AUSTENITIC GRAIN GROWTH. J. E. Dorn and O. E. Harder, Battelle Memorial Institute.

4:30 p.m.—Auditorium

STEEL MAKING. Earnshaw Cook, American Brake Shoe & Foundry Co.

8:00 p.m.—Auditorium

METALLOGRAPHIC TECHNIQUE. J. R. Vilella, United States Steel Corp.

Wednesday, October 20

9:30 a.m.—Ambassador Hotel

ANNUAL MEETING. Edward De Mille Campbell Memorial Lecture presented by W. P. Sykes, General Electric Co.

2:00 p.m.—Auditorium Ball Room

THE EFFECT OF MASS UPON THE MECHANICAL PROPERTIES OF CAST STEEL. C. W. Briggs and R. A. Gezelius, U. S. Naval Research Laboratories.

THE FATIGUE RESISTANCE OF STEEL AS AFFECTED BY SOME CLEANING METHODS. J. H. Frye, Jr., and G. L. Kehl, Lehigh University.

INFLUENCE OF HEAT TREATMENT ON CREEP OF CARBON-MOLYBDENUM AND CHROMIUM-MOLYBDENUM-SILICON STEEL. R. F. Miller, R. F. Campbell, R. H. Aborn, U. S. Steel Corp., and E. C. Wright, National Tube Co.

4:30 p.m.—Auditorium

STEEL MAKING. Earnshaw Cook, American Brake Shoe & Foundry Co.

8:00 p.m.—Auditorium

METALLOGRAPHIC TECHNIQUE. J. R. Vilella, United States Steel Corp.

Thursday, October 31

10:00 a.m.—Ambassador Hotel

Symposium on Carburizing

A REVIEW OF SOME FUNDAMENTALS OF CARBURIZING. M. A. Grossmann, Carnegie-Illinois Steel Corp.

A THEORETICAL DISCUSSION OF THE ACTION OF SOLID CARBURIZING AGENTS. H. W. McQuaid, Republic Steel Corp.

GASEOUS MEDIA FOR CARBURIZING. G. T. Williams, Cleveland Tractor Co.

Simultaneous Session—Ambassador Hotel

THE INITIAL STAGES OF GRAPHITIZATION. H. A. Schwartz and M. K. Barnett, National Malleable and Steel Castings Co.

AN X-RAY STUDY OF THE Ar_3 AND

Annual National Metal Congress

A_{c_3} Points of Iron and Iron-Nickel Alloys. Sidney D. Smith, Pennsylvania State College.

Graphitization in High Purity Iron-Carbon Alloys. Cyril Wells, Carnegie Institute of Technology.

2:00 p.m.—Auditorium Ball Room

Symposium on Carburizing

Factors Governing Selection of Type of Carburized Case. A. L. Boegehold and C. J. Tobin, General Motors Corp.

Furnace Atmospheres and Decarburization. J. A. Webber, Interstate Drop Forge Co.

Steels Used in the Carburizing Process. O. W. McMullan, Youngstown Sheet & Tube Co.

A Hardenability Test for Carburizing Steel. W. E. Jominy and A. L. Boegehold, General Motors Corp.

Simultaneous Session—Auditorium—Room B

Solubility of Copper in the Grain-Boundary Material of a Solid Solution of Copper in Zinc. G. R. Dean, Miner Laboratories, and W. P. Davey, Pennsylvania State College.

The Rate of Austenite Transformation in Cast Iron. D. W. Murphy, W. P. Wood and D. Giradi, University of Michigan.

The Effects of Columbium and Other Addition Agents on Low Chromium Steels. Russell Franks, Union Carbide & Carbon Research Laboratories, Inc.

4:30 p.m.—Auditorium

Steel Making. Earnshaw Cook, American Brake Shoe & Foundry Co.

Friday, October 22

10:00 a.m.—Ambassador Hotel

Symposium on Carburizing

Production Carburizing. E. F. Davis, Warner Gear Div., Borg-Warner Corp.

A Study of Commercial Carburizing Containers. R. W. Roush and A. C. Dames, Timken-Detroit Axle Co.

The Physical and Chemical Characteristics of Carburizing Compounds and Their Handling in Production. S. L. Widrig, Spicer Mfg. Co.

Simultaneous Session—Ambassador Hotel

Effects of Longitudinal Scratches on Valve Spring Wire. F. P. Zimmerli and G. D. Wilson, Barnes-Gibson-Raymond, and W. P. Wood, University of Michigan.

Recovery of Cold-Worked Nickel on Annealing. Erich Fetz, Wilbur B. Driver Co.

Metal Coloring. C. B. F. Young, Columbia University.

2:00 p.m.—Auditorium Ball Room

Symposium on Carburizing

Commercial Gas Carburizing. L. D. Gable and E. S. Rowland, Timken Roller Bearing Co.

Light Cases by Gas Carburizing. V. T. Malcolm, Chapman Valve Mfg. Co.

Liquid Bath Carburizing. B. B. Beckwith, Chrysler Corp.

Simultaneous Session—Auditorium—Room B

A Study of Deoxidation Type Inclusions in Alloy Steels. W. A. Hare and Gilbert Soler, Timken Roller Bearing Co.

Some Problems in the Production of Low-Carbon Sheets in Non-Continuous Mills. M. L. Samuels, Alfred Boyles, Battelle Memorial Institute.

Relation of Size of Spheroids in Tool Steel to its Machinability and to Holding Edge of Cutter. D. E. Roda, International Business Machines Corp.

4:30 p.m.—Auditorium

Steel Making. Earnshaw Cook, American Brake Shoe & Foundry Co.

The Wire Association

Monday, October 18

1:00 p.m.—Hotel Ambassador

Directors' Meeting.
Program Committee Meeting and Lunch.

2:00 p.m.—Hotel Ambassador

Fatigue Properties of Helical Springs. R. R. Tatnall, engineer, Morgan Works, Wickwire Spencer Steel Co.

Tuesday, October 19

9:30 a.m.—Hotel Ambassador

Note on the Annealing of Nickel Silver Wire in Coils. Thurston C. Merriman, metallurgist, Seymour Mfg. Co.

New Developments in Material Handling for Wire Mills. A. F. Anjeskey, sales manager, Cleveland Tramrail Division, Cleveland Crane & Engineering Co.

The Making of Steel Wire. Bethlehem Steel Co. Motion Picture.

2:00 p.m.—Hotel Ambassador

Lime in Wire Drawing. D. E. Washburn, chief chemist, American Lime & Stone Div., Warner Co.

A. C. Electro-Pickling. Allan B. Dove, chemical engineer, Canada Works, The Steel Co. of Canada, Ltd.

Handling Waste Acids from Pickling Operations. H. E. Klein, engineer, B. F. Goodrich Co.

Wednesday, October 20

9:30 a.m.—Hotel Ambassador

Ferrous Division

Cold Heading. L. S. Cooch, metallurgist, Buffalo Bolt Co.

Cold Heading Developments at G. E. A. R. Ryan, industrial engineer, General Electric Co.

Non-Ferrous Division

Production of Copper from Mine to Mill. Wm. H. Bassett, Jr., manager, metallurgical development, Anaconda Wire & Cable Co.

Noranda Enterprises. Motion Picture.

2:00 p.m.—Hotel Ambassador

Ferrous Division

Abnormal Grain Growth and the Annealing of Wire. B. L. McCarthy, chief metallurgist, Wickwire Spencer Steel Co.

Non-Ferrous Division

The Manufacture of Fourdrinier Wires. Hugh E. Brown, director of research, W. S. Tyler Co.

Modern Needs for Copper Wire. L. H. Burnham, engineer, Transportation Division, General Electric Co.

4:30 p.m.—Hotel Ambassador

Annual Meeting of The Wire Association. Award of The Wire Association Medal, by John C. Callaghan.

7:30 p.m.—Hotel Ambassador

Annual Dinner.

Thursday, October 21

10:00 a.m.—Hotel Ambassador

A Metallurgical Study of the Factors Affecting the Quality of Galvanizing. R. W. Sandelin, chief metallurgist, Atlantic Steel Co.

Nickel and Nickel-Base Alloys and Rod Products. Carl Rolle, Development and Research Division, International Nickel Co., Inc.

2:00 p.m.—Hotel Ambassador

Cold Drawn Bars. D. W. McDowell, metallurgist, Union Drawn Steel Co.

Production of Bolts for Railroads and Bridges. Chas. Fassinger, vice-president, Oliver Iron & Steel Corp.

The Making of Steel Wire. Bethlehem Steel Co. Motion Picture.

A. E. GIBSON, *President, American Welding Society*

American Welding Society

Monday, October 18

9:30 a.m.—Hotel Traymore

Business Session, President A. E. Gibson, presiding.
Report on welding research activities by C. A. Adams.
Status of progress and work by committee chairmen.
Award of Samuel Wylie Miller Memorial Medal.
Award of Lincoln Medal.
Progress report by managing director.
Review of section activities by regional vice-presidents and section chairmen or representatives.
Report on election of officers.

2:00 p.m.—Hotel Traymore

G. F. Jenks, Col. Ord. Dept., U. S. Army —*Chairman.*
E. Vom Steeg, General Electric Co.—*Vice-Chairman.*

WELDABILITY OF LOW ALLOY STEELS. W. L. Warner, Watertown Arsenal.

THE SPOT WELDING CHARACTERISTICS OF SOME COPPER BASE ALLOYS. D. K. Crampton and J. J. Vreeland, Chase Brass & Copper Co.

SURVEY OF LOW-ALLOY STEELS AS TO WELDABILITY. J. H. Critchett, Union Carbide & Carbon Research Laboratories.

PHYSICAL PROPERTIES AND CORROSION RESISTANCE OF NICKEL-IRON ALLOYS FORMED IN THE WELDING OF NICKEL-CLAD STEEL. J. H. Deppeler, W. G. Thiesinger and F. G. Flocke.

X-RAY METHODS OF STUDYING STRESS RELIEF IN WELDS. J. T. Norton, Massachusetts Institute of Technology.

6:30 p.m.—Hotel Traymore

Dinner and meeting of Board of Directors.
Review of society activities, appointment of committees and officers.

Tuesday, October 19

9:30 a.m.—Hotel Traymore

Everett Chapman, Lukenweld, Inc.—*Chairman.*
Otto H. Henry, Polytechnic Institute of Brooklyn.—*Vice-Chairman*

FATIGUE TESTS OF BUTT WELDS IN PLATES. W. M. Wilson, University of Illinois.

PROXIMITY EFFECT IN WELDING PROBLEMS. E. Bennett, University of Wisconsin.

THE HEAT EFFECT IN WELDING. W. H. Bruckner, U. S. Naval Research Laboratory.

2:00 p.m.—Hotel Traymore

T. M. Jackson, Sun Shipbuilding & Dry Dock Co.—*Chairman*
J. H. Zimmerman, The Linde Air Products Co.—*Vice-Chairman*

WELDED GIRDERS WITH INCLINED STIFFENERS. Cyril D. Jensen, Lehigh University.

WELDING OF COPPER. A. P. Young, Michigan College of Mining & Technology.

STATIC AND IMPACT TENSILE PROPERTIES OF STAINLESS STEEL WELDS AT ORDINARY AND LOW TEMPERATURES. O. H. Henry, Polytechnic Institute of Brooklyn.

EFFECT OF WELDED CLIP ANGLES ON BEAM-COLUMN CONNECTIONS. By Inge Lyse, Lehigh University.

HIGH-SPEED MOTION PICTURES OF FLAME CUTTING. H. R. Bullock, Massachusetts Institute of Technology.

2:00 p.m.—Hotel Traymore

Joint session with American Society of Mechanical Engineers.

RESISTANCE WELDING FABRICATION. J. M. Cooper, General Electric Co.

DEVELOPMENTS IN LARGE WELDED STRUCTURES. C. C. Brinton, Westinghouse Electric & Mfg. Co.

7:30 p.m.—Hotel Traymore

Conference and Meeting of Fundamental Research Committee.
H. M. Hobart, General Electric Co.—*Chairman.*

This conference is scheduled for university research workers in the fundamentals of welding.

Wednesday, October 20

9:30 a.m.—Hotel Traymore

H. C. Boardman, Chicago Bridge & Iron Works.—*Chairman*
E. V. David, Air Reduction Sales Co.—*Vice-Chairman*

CARBON ARC WELDING IN AUTOMOTIVE WORK. William Richards, Chevrolet Motor Co.

AUTOMATIC RESISTANCE WELDING. Harry Landstrom, Nash-Kelvinator Corp.

WELDING—AN AID IN DAM CONSTRUCTION.

Thursday, October 21

9:30 a.m.—Hotel Traymore

W. M. Mitchell, Carnegie Illinois Steel Co.—*Chairman*
Milton Male, U. S. Steel Corp.—*Vice-Chairman*

LOW ALLOY STEELS. G. S. Mikhalapov, Heintz Mfg. Co.; A. B. Kinzel, Union Carbide & Carbon Research Laboratories.

HIGH ALLOY STEELS. J. C. Holmberg, Struthers-Wells-Titusville Corp., R. Vincent, Alloy Fabricators.

2:00 p.m.—Hotel Traymore

Charles I. MacGuffie, General Electric Co. —*Chairman*
J. J. Crowe, Vice-Chairman; Air Reduction Sales Co.—*Vice-Chairman*

WELDING IN BUILDING TANKER VESSELS. T. M. Jackson, Sun Shipbuilding & Dry Dock Co.

ASSEMBLY PLANT FOR THE WELDING OF BARGES. Geo. F. Wolfe, Dravo Corp.

PHASES OF TESTING IN THE WELDING OF NAVAL VESSELS. W. P. Roop, Lieut. Commdr., U. S. Navy.

ALL-WELDED STEEL TANKERS. A. C. Leigh, The Ingalls Iron Works Co.

7:00 p.m.—Hotel Traymore

Dinner Dance and Entertainment.

Friday, October 22

9:30 a.m.—Hotel Traymore

P. G. Lang, Jr., The Baltimore and Ohio Railroad Co.—*Chairman*
A. F. Davis, The Lincoln Electric Co.—*Vice-Chairman*

BUILDING UP LOCOMOTIVE DRIVING BOXES. I. T. Bennett, Revere Copper & Brass, Inc.

MACHINE GAS CUTTING IN RAILROAD WORK. H. Bass, New York Central Railroad.

WELDING OF RAILROAD ROLLING STOCK. V. R. Willoughby, American Car and Foundry Co.

The Atlantic City Convention Hall where the National Metal Show will be housed

National Metal Show

Atlantic City Convention Hall, October 18-22, 1937

Those Who Will Exhibit

(Booth number follows company name)

AIR REDUCTION SALES CO., *(E-62). Welding and cutting torches, brazing and hard facing apparatus.*

AJAX ELECTRIC CO., INC., *(D-37). Electric heat treating furnaces.*

AJAX ELECTROTHERMIC CORP., *(D-37). High frequency furnaces.*

ALLEGHENY STEEL CO., *(C-47). Stainless steels, sheets, bars, plates, strip, tubing, wire, rivets.*

EDGAR ALLEN STEEL CO., INC., *(H-12). Tools and die steels.*

ALOX CORP., *(G-11). Rust preventatives.*

ALUMINUM CO. OF AMERICA, *(G-4). Aluminum alloys.*

AMERICAN BRASS CO., *(G-47). Copper alloys.*

AMERICAN BRIDGE CO., *(Stage). (See United States Steel Corp.)*

AMERICAN CAR & FOUNDRY CO., *(G-15). Electric bar heaters, forging heaters, rivet heaters.*

AMERICAN CHAIN & CABLE CO., *(A-32). Nibbling machines, die sets, welding wire.*

AMERICAN COACH & BODY CO., *(A-73). Spot welders.*

AMERICAN CYANAMID & CHEMICAL CORP., *(G-79). Case hardening compounds, chemicals.*

AMERICAN ELECTRIC FURNACE CO., *(C-39). Electric furnaces.*

AMERICAN FOUNDRY EQUIPMENT CO., *(B-40). Cleaning and descaling equipment.*

AMERICAN GAS ASSOCIATION, *(Gas Section). Gas equipment.*

AMERICAN GAS FURNACE CO., *(Gas Section). Heat treating furnaces.*

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, *(A-80). Educational exhibit.*

AMERICAN MACHINE & METALS, INC., RIEHLE DIVISION, *(F-8). Hardness testing machines.*

AMERICAN ROLLING MILL CO., *(E-40). Stainless steels, enameling iron, sheets and plates.*

AMERICAN SHEET & TIN PLATE CO., *(Stage). (See United States Steel Corp.)*

AMERICAN SOCIETY FOR METALS, *(H-85). Educational exhibit.*

AMERICAN STEEL & WIRE CO., *(Stage). (See United States Steel Corp.)*

AMERICAN WELDING SOCIETY, *(C-3). Educational exhibit.*

AMPCO METAL, INC., *(H-2). High strength nonferrous alloys.*

ANDERSON & SONS, *(G-2). Etched and lithographed metal products.*

ARCOS CORPORATION *(B-2). Welding accessories.*

ARMSTRONG CORK PRODUCTS CO., *(G-46). Insulating materials.*

ATLAS FENCE CO., *(H-45). Industrial fences.*

AUDUBON WIRE CLOTH CORP., *(H-45). Mesh, space and flexible wire cloth for industrial applications.*

AUTOMATIC GASFLUX, INC., *(A-78). Fluxes automatically fed into gas line for welding operations.*

AUTOMATIC TEMPERATURE CONTROL CO., INC., *(B-65). Temperature control systems, control valves for air, gas, water, oil and steam.*

BABCOCK & WILCOX CO., *(B-14). Refractories.*

BALDWIN - SOUTHWARK CORP., *(F-44). Testing machines.*

BARRETT-CRAVENS CO., *(A-10). Industrial trucks.*

BASTIAN-BLESSING CO., *(A-23). Oxyacetylene welding and cutting equipment.*

BAUSCH & LOMB OPTICAL CO., *(H-64). Optical instruments for metallography and spectrography.*

BELLIS HEAT TREATING CO., *(A-2). Heat treating salts and furnaces.*

BETHLEHEM STEEL CO., *(D-66). Carbon and alloy steels.*

G. S. BLAKESLEE & CO., *(A-66). Cleaning and degreasing machines.*

BOTFIELD REFRACTORIES CO., *(B-69). Refractories.*

BRISTOL CO., *(G-66). Pyrometers, temperature control equipment.*

BROWN INSTRUMENT CO., *(B-75). Indicating and recording instruments, automatic control equipment.*

ADOLPH I. BUEHLER, *(B-17). Metallographic equipment.*

BURDETT MFG. CO., *(Gas Section). Gas burning equipment.*

ANDREW C. CAMPBELL DIV., AMERICAN CHAIN & CABLE CO. *(A-32). Nibbling machines, die sets, welding wire.*

CARBOLOY CO., INC., *(F-48). Cemented carbide tools.*

CARBORUNDUM CO., *(H-24). Abrasives, grinding and cutting wheels, refractory products.*

CARNEGIE-ILLINOIS STEEL CORP., *(Stage). (See United States Steel Corp.)*

CHAPMAN VALVE MFG. CO., *(A-15). Chapmanizing process, steel valves.*

CLIMAX MOLYBDENUM CO., *(C-15). Molybdenum steels and irons.*

COLMONOY CO., *(G-76). Hard facing materials, cutting tools.*

COLUMBIA STEEL CO., *(Stage). (See United States Steel Corp.)*

CONTINENTAL MACHINE SPECIALTIES, *(B-18). Precision filing and sawing equipment.*

CROWN RHEOSTAT & SUPPLY CO., *(F-92). Plating and polishing tools.*

CRUCIBLE STEEL CO. OF AMERICA, *(B-8). Tool steels.*

CYCLONE FENCE CO., *(Stage). (See United States Steel Corp.)*

A. P. DESANNO & SON, *(H-15). Abrasive cutting equipment.*

DESPATCH OVEN CO., *(Gas Section). Gas heat treating furnaces.*

DETROIT REX PRODUCTS CO., *(H-35), Metal cleaning equipment.*

DETROIT TESTING MACHINE CO., *(H-39). Physical testing apparatus.*

HENRY DISSTON & SONS, INC., *(A-18). Saws, knives, files, steel and tools.*

JOSEPH DIXON CRUCIBLE CO., *(B-44). Stoppers, nozzles and sleeves.*

DOW CHEMICAL CO., *(G-86). Magnesium alloy die castings, forgings, rolled sheet and plate, and extruded sections.*

DRIVER-HARRIS CO., *(F-84). Heat and corrosion resisting castings, carburizing boxes, and furnace parts.*

E. I. DU PONT DE NEMOURS & CO., GRASSELLI DIVISION, *(C-10). Pickling inhibitors, fluxes, acids, chemicals for plating.*

E. I. DU PONT DE NEMOURS & CO., R. & H. CHEMICALS DEPT., *(F-14). Heat treating salts, sodium, plating chemicals, metal cleaners.*

ECLIPSE FUEL ENGINEERING CO., *(Gas Section). Heat treating furnaces and equipment.*

EISLER ENGINEERING CO., *(G-71). Welding machines.*

ELECTRIC FURNACE CO., *(D-80). Heat treating furnaces.*

ELECTRIC REFRACTORIES CO., *(H-8). Refractories.*

ELECTRO ALLOYS CO., *(C-20). Heat and corrosion resisting alloys.*

ELECTRO METALLURGICAL CO., *(H-52). Alloy steels and cast irons.*

ELEVATOR SUPPLIES CO., *(F-2). Wire drawing machines.*

ENSIGN-REYNOLDS, INC., *(Gas Section). Soft metal melting furnaces, soldering furnaces, burners, gas compressors, air blowers.*

You are invited to visit the

American Machinist Booth G-1

while at the Metal Show

FIRTH-STERLING STEEL CO., *(F-68). Carbide tools, stainless steel products, wear resisting parts.*

FLORENCE PIPE FOUNDRY & MACHINE CO., *(H-41). Meehanite castings.*

J. B. FORD SALES CO., *(G-43). Metal cleaners, burnishing compounds.*

FOXBORO CO., *(G-36). Measurement and control instruments.*

GAS MACHINERY CO., *(Gas Section). Forging furnaces.*

GEHNRICH & GEHNRICH, *(Gas Section). Ovens, dryers, air heaters.*

GENERAL ALLOYS CO., *(E-10). Heat and corrosion resisting alloys, furnace parts.*

GENERAL ELECTRIC CO., *(A-33). Electric furnaces and welding machines.*

GENERAL ELECTRIC X-RAY CORP., *(A-33). X-ray testing equipment.*

GLOBAR DIVISION, CARBORUNDUM CO., *(H-24). High temperature heating elements.*

GROB BROTHERS, *(G-75). Die making equipment, saws, filing machines, brazing devices.*

HALCOMB STEEL CO., *(B-8). Tool steels and alloy steels.*

HANDY & HARMAN, *(B-35). Brazing alloys and silver solders.*

HARNISCHFEGER CORP., *(C-1). Electric welding equipment and motors.*

HAUCK MANUFACTURING CO., *(A-75). Oil and gas burners, regulating valves.*

C. I. HAYES, INC., *(B-41). Heat treating furnaces.*

HEAT TREATING & FORGING, *(A-70). Publications.*

HAYNES-STELLITE CO., *(H-52). Cutting tools, corrosion resistant castings.*

HELLER BROTHERS CO., *(L-3). Small tools.*

HEPPENSTALL CO., *(B-1). Shear blades.*

HEVI DUTY ELECTRIC CO., *(F-41). Electric heat treating equipment.*

HOBART BROTHERS CO., *(C-38). Electric arc welding equipment.*

A. F. HOLDEN CO., *(B-32). Heat treating baths.*

HOLLUP CORP., *(A-62). Electric arc welders, electrodes and equipment.*

CHARLES A. HONES, INC., *(Gas Section). Gas oven furnaces, melting furnaces, soft metal and soldering furnaces, industrial gas burners.*

E. F. HOUGHTON & CO., *(B-95). Carburizing compounds, heat treating salts, industrial lubricants, cutting oil, leather belting and packings.*

ILLINOIS TESTING LABORATORIES, INC., *(B-83). Pyrometers, thermometers.*

INDUSTRIAL STEEL CASTING CO., *(C-91). Steel castings.*

INTERNATIONAL NICKEL CO., INC., *(E-75). Nickel and nickel alloys.*

JESSOP STEEL CO., *(G-10). Tool steels and alloy steels.*

JOHNS-MANVILLE, *(C-43). Insulating and refractory materials.*

JONES & LAUGHLIN STEEL CORP., *(E-32). Hot and cold rolled steel, tin plate.*

C. M. KEMP MFG CO., *(Gas Section). Gas producers and premixers.*

G. N. KROUSE, *(F-5). Fatigue testing machines.*

LEBANON STEEL FOUNDRY, *(B-15). Steel castings.*

LEEDS & NORTHRUP CO., *(F-63). Heat treating furnaces, pyrometers and controlling instruments.*

E. LEITZ, INC., *(G-14). Photomicrographic apparatus.*

LEPEL HIGH FREQUENCY LABORATORIES, *(C-48).*

LEWIS MACHINE CO., *(B-4). Wire drawing machinery.*

LINCOLN ELECTRIC CO., *(C-32). Electric welding equipment and supplies.*

LINDBERG ENGINEERING CO., *(A-67). Heat treating equipment.*

LINDE AIR PRODUCTS CO., *(H-52). Welding and cutting apparatus, welding gases.*

LUDLUM STEEL CO., *(G-95). Tool and alloy steels.*

MAAS AND WALDSTEIN CO., *(A-6). Lacquers, enamels, synthetics, etc.*

MACKLIN CO., *(B-45). Grinding wheels, cut-off machines.*

MAGNAFLUX CORP., *(G-42). Inspection method and equipment.*

MAGNETIC ANALYSIS CORP., *(G-63). Magnetic analysis equipment.*

MAHR MANUFACTURING CO., *(B-81). Oil and gas furnaces, burners.*

MANGANESE STEEL FORGE CO., *(H-45). Manganese steel wire cloth, screens, forgings, welding wire.*

MANHATTAN RUBBER MFG. CO., *(G-35). Abrasive cut-off and finishing wheels.*

MARBURG BROTHERS, INC., *(G-6). Cutting tools, gages, pneumatic hammers.*

MAURATH, INC., *(A-50). Welding electrodes.*

MCKAY COMPANY, *(H-81). Welding electrodes.*

METAL & THERMIT CORP., *(F-22). Welding electrodes and equipment.*

METALS COATING CO. OF AMERICA, *(E-62). Sprayed metal coating equipment.*

METLAB CO., *(D-17). Demonstration of heat treatment of metals.*

MICHIGAN STEEL CASTING CO., *(F-40 and G-39). Heat and corrosion resisting castings.*

A. MILNE & CO., *(H-12). Tool and die steels.*

MINNEAPOLIS-HONEYWELL REGULATOR CO., *(B-75). (See Brown Instrument Co.)*

MOLYBDENUM CORP. OF AMERICA, *(C-35). Molybdenum and tungsten alloys.*

MORRISON ENGINEERING CO., *(C-83). Equipment for wire mills.*

MULLITE REFRACTORIES CO., *(B-3).*

NATIONAL CARBIDE CORP., *(E-62). Carbide.*

NATIONAL CYLINDER GAS CO., *(B-22). Oxy-acetylene cutting machines.*

NATIONAL GAS FURNACE CO., *(A-72). Heat treating furnaces.*

NATIONAL TUBE CO., *(Stage). Tubing.*

NEW JERSEY ZINC SALES CO., *(F-32). Zinc alloys, die castings.*

NORTON COMPANY, *(A-1). Grinding wheels, refractories.*

OHIO CRANKSHAFT CO., *(L-8). Automatically hardened crankshafts.*

TINIUS OLSEN TESTING MACHINE CO., *(C-18). Testing machines.*

OWEN ELECTRIC SALES CO., *(C-4). Welding machines.*

PAGE STEEL & WIRE DIV., AMERICAN CHAIN & CABLE CO., *(A-32). Welding wire, miscellaneous wire.*

PANGBORN CORPORATION, *(A-81). Blast cleaning and dust collecting equipment.*

PARAMOUNT OILLESS BEARING CO., *(H-75). Oilless wood bearings and bushings, elevator guides, wood turnings.*

PARK CHEMICAL CO., *(H-84). Heat treating materials, buffing and polishing materials.*

PARKER-KALON CORP., *(B-21). Screws and fastening devices, measuring instruments, gage blocks.*

PARTLOW CORP., *(Gas Section) . Temperature controls, gas valves, safety pilots.*

HENRY PELS & CO., *(F-3). Cutting and fabricating machines.*

GEORGE F. PETTINOS, INC., *(A-14). Sands, gravels, insulating cements, graphites, foundry facings, etc.*

PHILADELPHIA DRYING MACHINERY CO., *(B-85). Heating furnaces, oil burners, gas burners.*

HORACE T. POTTS CO., *(G-73). Iron and steel.*

PRODUCTION MACHINE CO., *(F-80). Polishing, finishing and buffing machines.*

PYLE-NATIONAL CO., *(H-44). Airplane and airport lighting equipment, locomotive headlights, generating sets, etc.*

PYROMETER INSTRUMENT CO., *(E-17). Radiation, immersion, optical and surface contact pyrometers.*

QUIGLEY CO., INC., *(E-2). Refractories.*

REPUBLIC STEEL CORP., *(D-32). Alloy and stainless steels, sheets, bolts and nuts, pig iron, etc.*

RIEHLE DIVISION, AMERICAN MACHINE & METALS, INC., *(F-8). Hardness testing machines.*

RIVERSIDE METAL CO., *(F-10). Non-ferrous alloys.*

STANLEY P. ROCKWELL CO., INC., *(H-71). Heat treating equipment.*

JOHN A. ROEBLING'S SONS CO., *(A-11). Wire rope and miscellaneous wire.*

RUSTLESS IRON & STEEL CORP., *(A-22). Rustless and stainless steels and irons.*

JOSEPH T. RYERSON & SON, INC., *(B-9). Steel and allied products.*

SAFETY GAS LIGHTER CO., *(B-36). Gas lighters, gas ranges, hot water heaters.*

GEORGE SCHERR CO., INC., *(D-76). Optical instruments and testing machines.*

SCULLY STEEL PRODUCTS CO., *(Stage). (See United States Steel Corp.)*

SELAS CO., *(Gas Section). Gas premixers, burners, soldering systems.*

SENTRY CO., *(F-1). Hardening furnaces, high temperature tube furnaces.*

SEYMOUR MFG. CO., *(F-92). Nickel silver, phosphor bronze, sheet blanks, wire, rods, shells, etc.*

SHAKEPROOF LOCK WASHER CO., *(D-10). Lock washers.*

SHENANGO-PENN MOLD CO., *(D-83). Centrifugally cast bronze and bronze products.*

SLEEPER & HARTLEY, INC., *(H-65). Wire and spring making machinery.*

SPENCER TURBINE CO., *(B-71). Turbo compressors, vacuum cleaners.*

STEEL CITY TESTING LABORATORY, *(F-18). Testing machines.*

STOODY CO., *(H-88). Hard facing materials, cutting tools.*

D. A. STUART & CO., *(B-44). Industrial oils and greases.*

SURFACE COMBUSTION CORP., *(Gas Section). Heat treating furnaces, burners, accessories.*

SYNCRO MACHINE CO., *(F-2). Wire machinery.*

C. J. TAGLIABUE MFG. CO., *(B-41). Indicating, recording and controlling pyrometers.*

TAYLOR HALL WELDING CORP., *(H-75). Welding machines.*

TENNESSEE COAL, IRON AND RAILWAY CO., *(Stage). (See United States Steel Corp.)*

THERMAL PRODUCTS CORP., *(G-17). Insulating materials.*

TIMKEN ROLLER BEARING CO., *(E-48). Alloy steels.*

TITANIUM ALLOY MFG. CO., *(F-76). Titanium alloys and compounds.*

TORRINGTON MFG. CO., *(H-9). Wire manufacturing machines.*

UNA WELDING, INC., *(G-22). Welding machines.*

UNION CARBIDE AND CARBON CORP., *(H-52). Welding and cutting equipment, ferro-alloys, heat and corrosion resisting alloys.*

UNITCAST CORP., *(C-91). Steel castings.*

UNITED STATES STEEL CORP., *(Stage). Alloy steels, high tensile steels, stainless steels.*

UNIVERSAL-CYCLOPS STEEL CORP., *(H-84). Tool steels, stainless and specialty steels.*

VANADIUM-ALLOYS STEEL CO., *(G-32). Vanadium steel, tool steels.*

VANADIUM CORP OF AMERICA, *(H-20). Vanadium alloys and compounds.*

VICTOR SAW WORKS, INC., *(B-39). Hacksaw blades and machines.*

WELLS MFG. CORP., *(H-21). Metal cutting saws.*

WESTINGHOUSE ELECTRIC & MFG. CO., *(E-19). Welding equipment and electric furnaces.*

WHEELCO INSTRUMENTS CO., *(B-84). Temperature control instruments.*

WIEDEMANN MACHINE CO., *(A-46). Turret punches.*

H. A. WILSON CO., *(B-7). Platinum alloys, precious metals, thermostatic metals.*

WILSON MECHANICAL INSTRUMENT CO., *(C-50). Rockwell hardness testers.*

WILSON WELDER & METAL CO., *(E-62). Electric welding machines.*

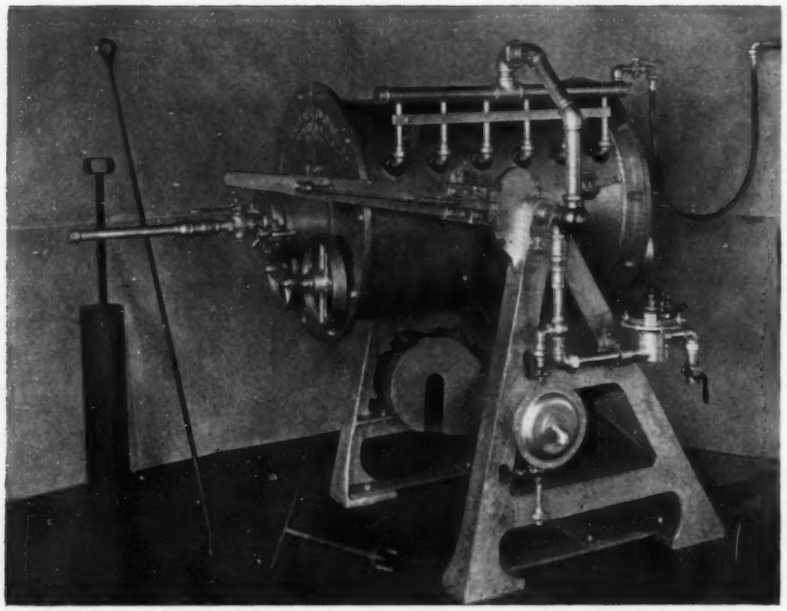
WIRE ASSOCIATION, *(A-40). Educational exhibit.*

YOUNGSTOWN SHEET & TUBE CO., *(A-63). Alloy steels.*

CARL ZEISS, INC., *(G-80). Microscopes and accessories.*

The Show in Print

This preview of the new equipment and materials to be displayed at the National Metal Exposition provides a link between the development laboratory and the metal-working plant



Firing from one side only permits flames and products of combustion to sweep freely around the retort of the American No. 1-F carburizer

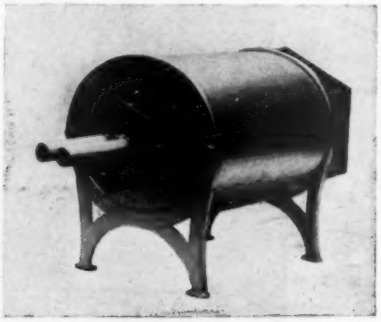
American No. 1-F Carburizer and No. 180 Reciprocating Full-Muffle Heater

Improvements in the No. 1-F rotary gas carburizer, and the No. 180 reciprocating heating machine have been announced by American Gas Furnace Co., Elizabeth, N. J. The No. 1-F rotary carburizer is now furnished with a lining of insulating refractory backed by block insulation. It is fired from one side only, to permit the flames and products of combustion to sweep freely entirely around the retort. This is claimed to insure uniform heating. Burners for this carburizer are served by a single-valve control, giving one-valve adjustment and efficient combustion over the entire operating range with a turndown of 6:1. Burners are balanced from front to back to insure uniform heating of the charge and uniform carburizing. Rotation of the Nichrome retort and the tilting feature are retained in the design to insure rapid, uniform heating and to minimize the work of charging and discharging the unit.

In the No. 180 heating machine, a full muffle is employed rather than the open-hearth of former designs. Means are provided for sealing at the discharge end, so that the work passes through the furnace without coming in contact with products of combustion, or air, from the time it enters the furnace until it is quenched. Any desired atmosphere can be carried in the furnace, according to the user's requirement for clean, hard work. Work is advanced by its own inertia over the hearth of this machine and discharge is claimed to be practically individual. Uniform heating results from the thin layer of work passing through the machine.

Sentry Improved Model V Electric Tube Furnaces

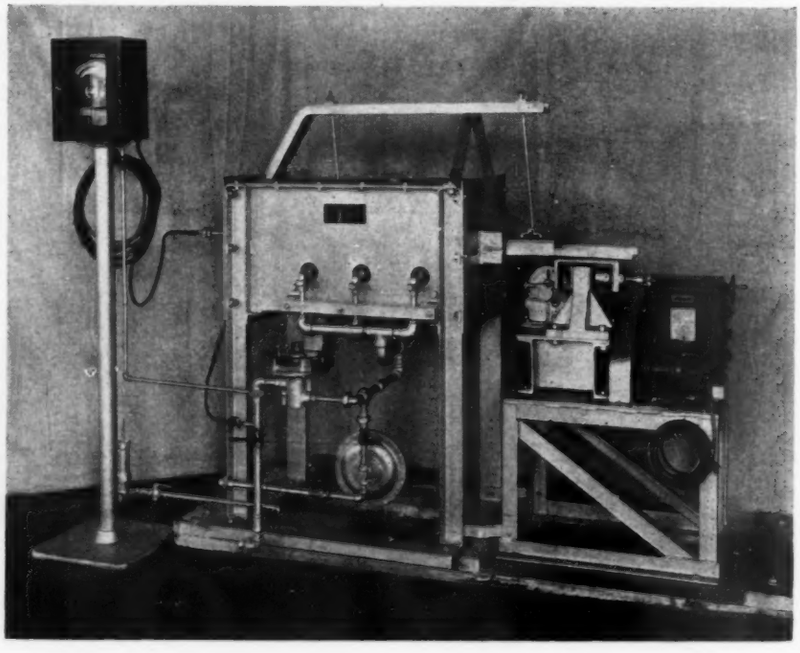
Available in both single and double-tube models, the Model V, high-temperature tube furnaces offered by The Sentry Company, Foxboro, Mass., have spring-mounted heating elements which are readily replaced while the furnace is hot. These electrically heated furnaces are available with several tube sizes and are designed primarily for combustion analysis procedures. They are of proper size and proportion to assure a suitably uniformly heated chamber for this purpose. The porcelain tubes



The Sentry Model V is designed for temperatures between 700 and 1400 C.

are gas-tight, will withstand the maximum furnace operating temperature, and are fitted carefully where they pass through the furnace end walls, to prevent unnecessary heat loss. Back ends of the tubes are twice

A Full-muffle replaces the open hearth used in previous designs of the American No. 180 heating machine



reduced in diameter, the first restriction being made as it leaves the heating chamber. The second reduction is made to a size convenient for a rubber tube connection.

The fuel tube furnace shown in the accompanying illustration has four 14-in. long heating elements installed parallel to the tube. They radiate heat directly on the tube to give a uniformly heated section about 9 in. long. This furnace can be connected to 110 or 220 volts a.c. or d.c. Overall furnace dimensions are 17 in. wide, 18 in. high by 24 in. long. Shipping weight is 275 lb. The No. 2 fuel tube furnace has two 1-in. bore by 26-in. long tubes.

Despatch Improved No. DT-6 Drawing and Tempering Furnace

Heavier construction throughout and an improved door-lifting mechanism are the major features claimed for the improved Despatch No. DT-6 furnace

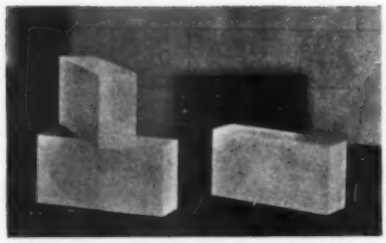
Construction of the No. DT-6 convected-air, gas-fired furnace for drawing and tempering dense loads, offered by Despatch Oven Co., 622 Ninth St., S.E., Minneapolis, Minn., previously described (*AM*—Vol. 80, page 1021), has been improved to withstand more severe service than the previous unit. Construction is heavier and the door-lifting mechanism has been changed so that the door seals only by its own weight. A double-seal is provided around the door, instead of the single seal previously used. Revision in design of the door-lifting mechanism has been made so that the door merely lifts up should there be an explosion because, for instance, oily parts are placed inside the furnace.

The standard unit now has an air flow switch, a "Pressurestat" and a safety pilot-light arrangement. Design of the fan has been improved and faster circulation of air is obtained under increased pressure. Unit is arranged for a maximum temperature of 1,200 F.

This furnace is designed particularly for all types of dense loads as well as for coarse loads which will fit into the basket, which is 16 in. diameter by 12 in. deep. Operating uniformity is guaranteed to be plus or minus 5 F. at 1,200 F.

Johns-Manville JM-20 Insulating Brick

Listed as No. JM-20, an insulating brick announced by Johns-Manville, 22 E. 40th St., New York, N. Y., is claimed to possess the physical properties necessary for service under temperatures as high as 2,000 F. This brick can be employed as a back-up insulation in various types of high-temperature industrial equipment, such as annealing furnaces, producer-gas mains and other steel mill equipment. As an insulating refractory, the No. JM-20 brick is recommended for use in electric furnaces, radiant tube-type annealing furnaces, muffle-type furnaces or wherever no flame impingement, slag action or mechanical abrasion is present.

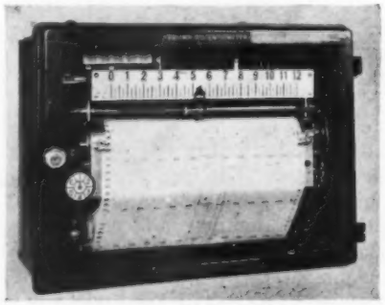


Possessing properties that make it suitable for use up to 2,000 F., the JM-20 is recommended for use as back-up insulation in furnaces

Brown Recording and Controlling Pyrometer

This multiple-recording and controlling potentiometer pyrometer, announced by The Brown Instrument Co., 4501 Wayne Ave., Philadelphia, Pa., operates on the balanced Wheatstone bridge principle and has all of the inherent features of standard Brown potentiometer pyrometers. These features include the 40-in. slide wire, inclosed galvanometer, and a synchronous motor drive. From two to six temperatures from as many different thermocouples can be recorded and controlled with this instrument.

Maximum legibility plus precision in recording multi-color numeral records are claimed. One of the principal features is a hardened steel, machine-cut numeral print wheel with a + sign, the intersection of the two lines representing the exact point of the time temperature trend. The vertical line of the + sign identifies the temperature and the horizontal line shows time.

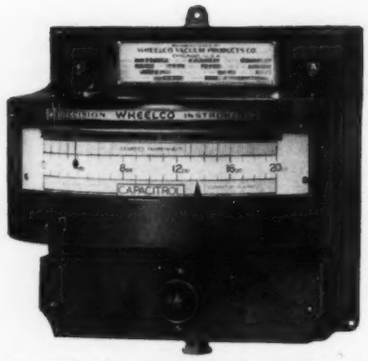


Capacity for recording and controlling up to six temperatures is claimed for this Brown potentiometer pyrometer

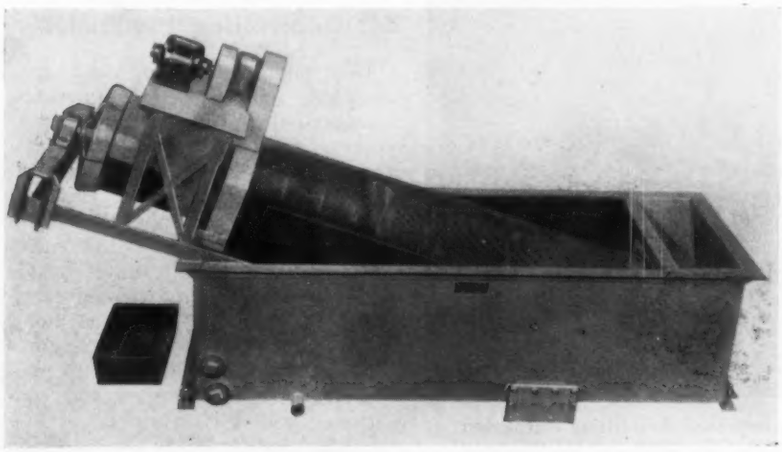
Proportioning Type Wheelco Capacitrol

Designed to provide constant temperatures for fuel-fired or electrically heated units, regardless of varying heat requirements, the Proportioning Capacitrol, offered by Wheelco Instruments Co., 1112-14 Milwaukee Ave., Chicago, Ill., balances the heat input against the heat required by the work. All operating functions are entirely electrical and it is claimed that this instrument overcomes time lag due to slow reaction of the furnace temperatures. The instrument operates in conjunction with simple valving or contacting equipment, and achieves the effect of a continuous input variation by varying the ratio of "on" time to "off" time in a time cycle of predetermined length.

The proportioning control operates by the "radial principle," a control used in the various Wheelco instruments previously described. Operation and function of the controller is governed by means of changes in wave length.



The Wheelco proportioning control is designed to control equipment heated by fuel or electricity



"Niagara" spiral quenching machines have been improved to eliminate jamming of small parts introduced into the unit

Blakeslee "Niagara" Spiral-Quencher

Hopper design of the "Niagara" spiral quenching machine, manufactured by G. S. Blakeslee & Co., 19th St. and 52nd Ave., Chicago, Ill., has been improved to make it possible to install a gasketed, air-tight connection to the chute to prevent oxidation of the hot work as it leaves the furnace. Manganese steel hoppers have been designed for unusually heavy work, to reduce wear and maintenance. The feed hopper at the spiral entrance has been changed to eliminate jamming and catching of small parts introduced into the unit. A discharge arrangement has been provided to supply cooled oil to the hopper from the cooling sump.

Extra-heavy spiral covering is perforated to suit customer's requirements and the unit rotates on Alemite lubricated steel rollers. End thrust is taken by a tapered Timken roller bearing. Spiral angle has been designed for positive discharge.

These units can be used for oil or water quenching and for washing quenched parts. The units can be placed in tandem, either in a straight line or at right angles to each other, so that parts can pass from the furnace through a quenching unit and then through a washing unit before being discharged into tote boxes. In several cases, units have been installed to provide for quenching, washing, rinsing, pickling, and drying operations in sequence.

ATC Automatic Furnace Firing Timer

Designed to control, on a time basis, the firing of furnaces which are fired at opposite ends, the ATC timer shown in the accompanying illustration is provided with a dial having two setting pointers and one moving pointer. Each fixed pointer is controlled by a separate knob outside the case and is set for the desired firing time on the right and left end of the furnace respectively. This instrument, offered by Automatic Temperature Control Co., Inc., 34 East Logan St., Philadelphia, Pa., repeats its cycle continuously.

The cam timer shown in the illustration controls two separate load circuits. When contact is made by the moving pointer as it passes zero, the cam timer makes one-half revolution, energizing one or the other load circuit depending upon the direction of motion of the dial hand. Energizing these cam load circuits starts the train of operations necessary to reverse the furnace, shutting off burners on one end, shifting dampers and starting burners on the opposite end.

The moving pointer is shown as it has passed the center position and is moving to the right. On reaching the fixed pointer, it reverses and comes back to zero, at which time a contact is made which starts the cam timer. The moving pointer continues to the left, reaches contact with the left fixed pointer and comes back to the zero point, at which time the contact is again made to restart the cam timer.

Cycle of the ATC furnace firing timer is initiated by a cam timing unit in the lower portion of the instrument

Temperature measurements made with the "Instagraph" are recorded on the strip chart of the instrument at the right

Bristol Electronic "Instagraph"

Standard radio tubes are used in the amplifying system of the Electronic "Instagraph", designed by The Bristol Co., S. Main St., Waterbury, Conn., for accurately recording rolling mill temperatures and the temperature of other heated bodies. The equipment consists of three units: a thermophotronic tube, a potentiometer amplifier and a recording instrument. The photronic cell in the tube or "gun" is affected only by the thermal spectrum radiated from a heated body. An instantaneous reading of the temperature is obtained and this reading is recorded on a strip chart.

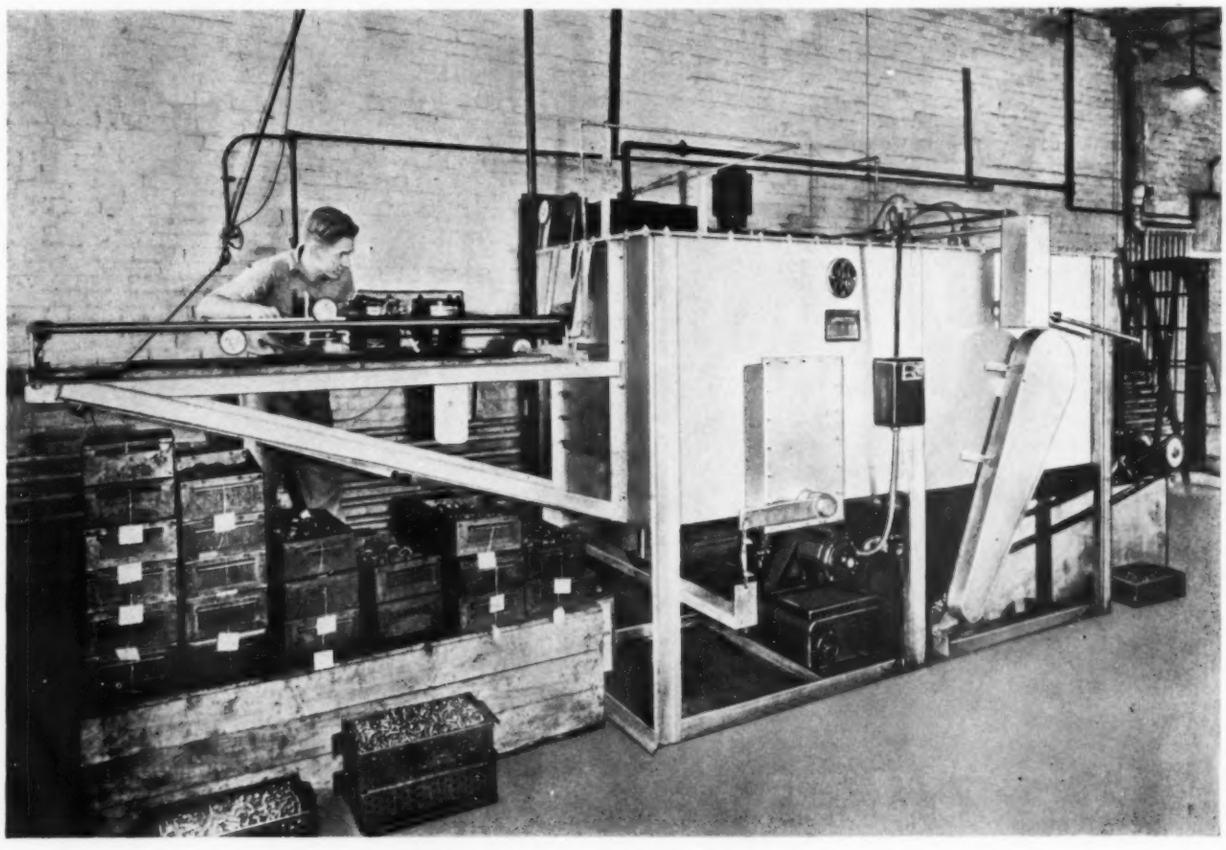
Electromotive force generated by the photronic cell is potentiometrically measured, amplified and recorded by the "Instagraph" in terms of temperature. Because of the sensitivity of the instrument and the speed of response to changes in temperature, it is adapted for measuring the temperature of moving bodies.

G.E. Hardening Furnace With Tray-Loading Device

This electric hardening furnace, a product of General Electric Co., Schenectady, N. Y., is equipped with a plate-belt type conveyor and a tray-loading device. Conveyor belt is 8-in. wide. Unit shown was designed for scale-free hardening of drill-chuck sleeves and has a 5 ft. long heating chamber. Electrical capacity is 24 kw.

The complete installation for this application includes the furnace, an electric drawing burner and degreasing equipment. A duplicate of the original installation will be shown in operation, through cooperation with the Jacobs Mfg. Co., Hartford, Conn.

Scale-free hardening of drill-chuck sleeves is accomplished in this G.E. electric hardening furnace



Air and oil supply to the Hauck proportioning oil burner are regulated by a single lever

Hauck Oil Burner

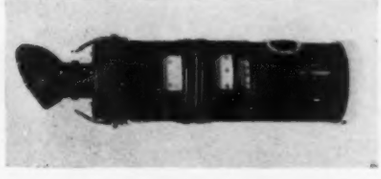
Movement of a single lever simultaneously regulates air and oil supply to the proportioning oil burner offered by Hauck Mfg. Co., 121 Tenth St., Brooklyn, N. Y. Correct air-oil ratio is automatically proportioned and maintained, and it is claimed that this burner will give accurate temperature control over a wide operating range.

This burner is said to be particularly suitable for furnaces requiring the maintenance of a controlled atmosphere. Carbon-dioxide readings are consistently held between 13 and 15 per cent. There is no need for relying on operators to adjust the burners to suit varying conditons.

Pyro "Bi-Optical" Pyrometer

Light filters and color wedges, which are transparent to a number of colors simultaneously, are used in the Pyro "Bi-Optical" pyrometer, announced by The Pyrometer Instrument Co., 103 Lafayette St., New York, N. Y., for the measurement of temperatures. By using filters, the need for a complicated optical or mechanical device for the combination of colors is eliminated.

The "Bi-Optical" pyrometer is claimed to make scientific measurements by which the temperature of the "black body" and the "actual" temperature may be ascertained simultaneously. The instrument is furnished with scale ranges from 900-1,900 C. or 1,700-3,500 F. It is claimed to be suitable for laboratory, research and industrial applications, including temperature measurements of incandescent iron and iron alloys.



Pyro "Bi-Optical" pyrometers are self-contained instruments for measurement of temperatures up to 3,500 F.

Partlow Temperature Recorders and Controllers

A line of temperature recorders and recording-controllers has been announced by Partlow Corp., 2 Campion Road, New Hartford, N. Y. Both of these types of instruments use a mercury-actuated flexible control element in which a specially designed diaphragm seals the mercury. When the element is used under conditions that would corrode the steel case, a protecting sleeve or well is provided to encase the bulb and tube.

Fig. 1—Partlow Model ARM temperature recording-controllers use sensitized paper and a stylus for making permanent records

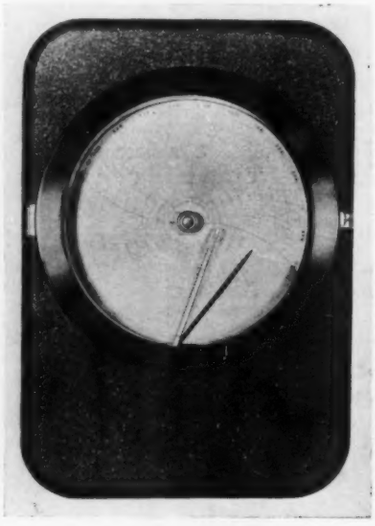
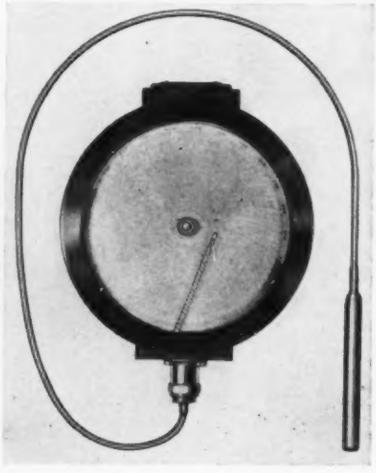


Fig. 2—Mechanism for the Partlow Model AP temperature recorder is installed in a locked, dust-proof case



Models AR and ARM recording-controllers will accurately control and record temperatures up to 1,000 F. A special sensitized paper and a stylus, instead of ink, make permanent records on a 10-in. diameter chart. Mechanism is installed in a dust-proof case which can be securely locked. Fig. 1 shows the Model ARM controller in a case suitable for flush or panel mounting. This instrument can also be furnished in the type of case shown in Fig. 2.

Models AP and APF temperature recorders also are designed for recording temperatures up to 1,000 F. The same sensitized paper and stylus are used in these instruments as are used for the temperature recording-controllers. These instruments are available in the form shown in Fig. 2, or in a case similar to that shown in Fig. 1.

Improved "Stabilog" Potentiometer Pyrometer

Recent improvements in the "Stabilog" potentiometer controller, manufactured by The Foxboro Co., Foxboro, Mass., are claimed to increase the reliability of the instrument. Resistance coils of the measuring system have been inclosed and exposed wiring has been eliminated. Parts on the interior side of the inner door have been rearranged to improve both the appearance and the quality of the instrument. Other improvements include platinum slide-wire contacts, a vernier-type rheostat and replaceable gold-alloy galvanometer suspensions.

"Stabilog" potentiometer controller offered by Foxboro now has a universal coil-plate mounted in a molded housing and has platinum slide-wire contacts

This temperature controller is de-

signed to give completely automatic, full-floating control on all ranges and in all conditions found in commercial processes. It combines the "Stabilog" air-operated system of control with the potentiometer-pyrometer system of temperature measurement. It may also be supplied with the Deviation Recorder to give records of control. Rate of control reaction is determined by the rate of change and not by definite pre-adjusted time intervals or magnitudes of valve action. There are no waiting periods or dead spots to rob the control of its full power over the process.

A.C.F. Berwick Type LAA Portable Forging Heater

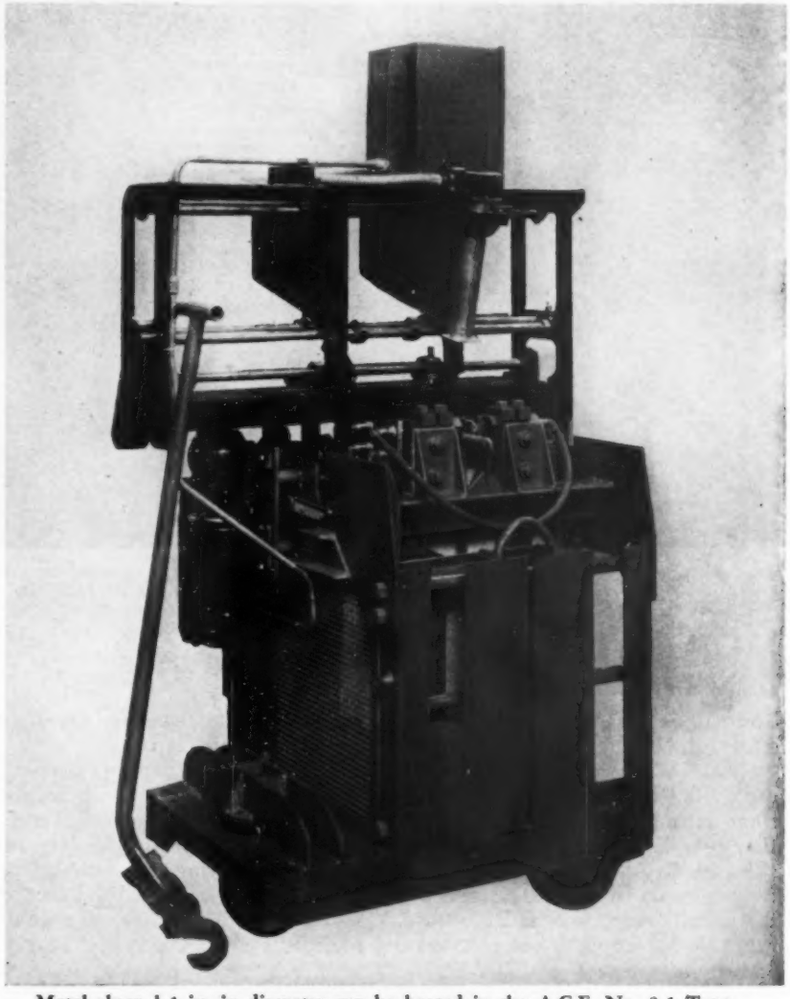
Equipped with two water-cooled electrodes, each having capacity for heating ¼-½ in. diameter slugs, the No. 3-1 Type LAA portable forging heater offered by American Car & Foundry Co., 30 Church St., New York, N. Y., has replaceable heating blocks. Heating is by contact resistance and the only loss is by radiation. It is claimed that the more rapidly the piece is heated, the lower is the electrical consumption. No current is consumed until the piece is gripped by the electrodes and current is immediately cut off when the piece reaches the temperature to which the controller has been previously set.

Photoelectric control is standard for all sizes of this type of heater. It is claimed that this method of heating slugs eliminates heat, smoke, odor and reduces scale to a minimum. The handle by which the unit is pulled through the shop is removable so that it will not be in the way of the operator while the machine is in use.

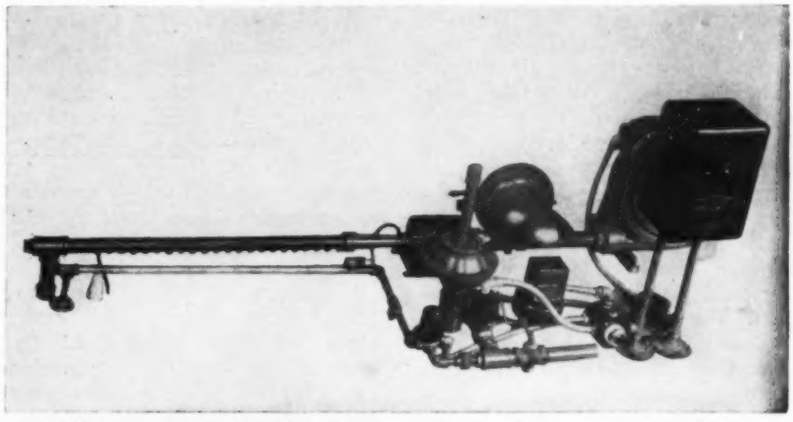
Eclipse Blast-Tip Ignition System

This automatic blast-tip ignition unit, offered by Eclipse Fuel Engineering Co., Rockford, Ill., is designed automatically to recycle in case of air failure, gas failure, ignition failure, or electric failure until service is resumed. This unit is equipped with a "Flame-Otrol" unit manufactured by the Wheelco Instrument Co., Chicago, Ill., and previously described (*AM*—Vol. 80 page 831).

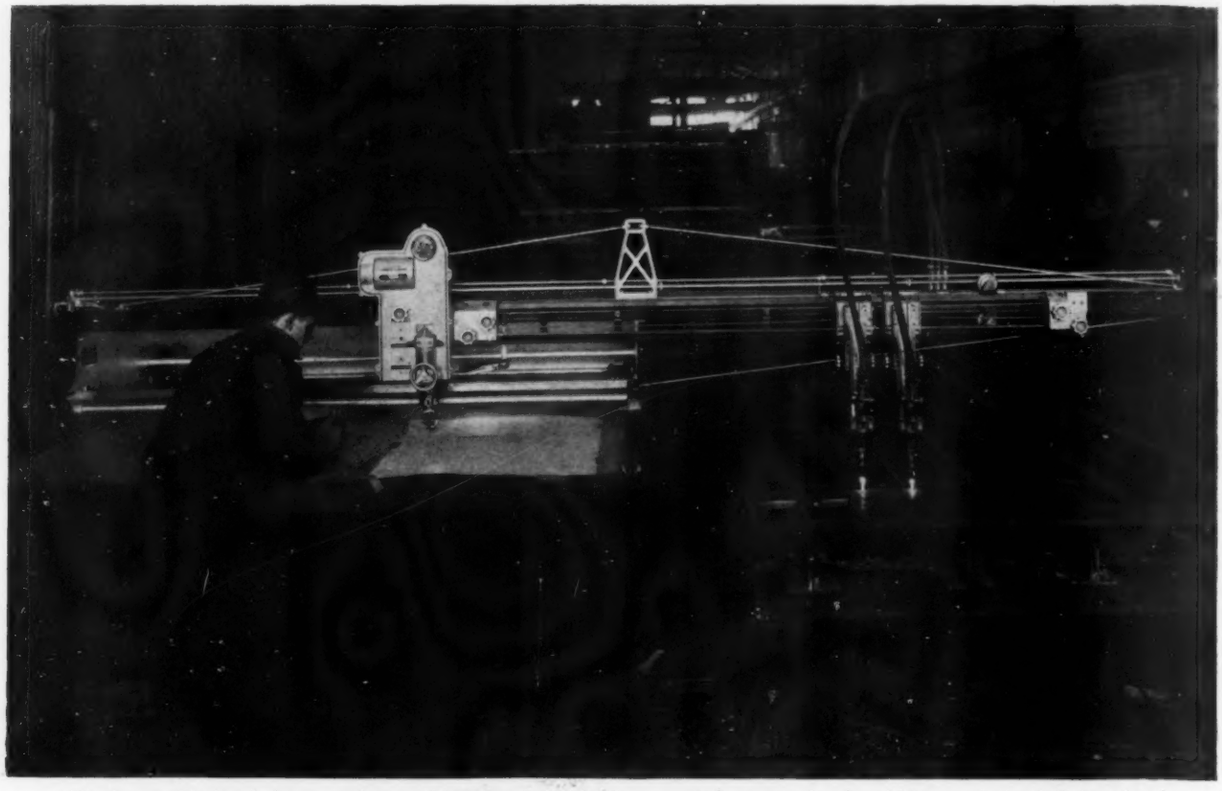
In operation, the blower is started to furnish air under pressure to the unit and the gas supply is then turned on. After this is done, a pushbutton switch is closed, admitting gas to the lighting unit and igniting the gas by means of a spark plug. When the flame reaches the end of the lighter pipe the "Flame-Otrol" element is actuated and the control box opens a solenoid operated valve to allow gas under pressure to pass into the main burner. When the lighting flame has been extinguished the last burner on the main burner line will activate the "Flame-Otrol" electrode and the main burners may be turned up or down as desired.



Metal slugs ¼-1 in. in diameter can be heated in the A.C.F. No. 3-1 Type LAA forging heater



Eclipse automatic blast-tip ignition system can be set to recycle or to remain shut down, in the event of flame failure



Torches on National shape cutting machines are individually mounted on crossheads which travel the full length of the carriage. These torches are held in place by adjustable gibs

National No. 612 Shape Cutter

The No. 612 shape cutting machine, offered by National Cylinder Gas Co., 205 West Wacker Drive, Chicago, Ill., is a flame-shaping machine capable of cutting a wide variety of shapes from steel plates, slabs, billets or forgings. The heavy table is mounted on steel lengths of fabricated construction and the tracing table has an unbroken rectangular working area of 72 sq.ft.

Fabricated carriage is designed to hold the long transverse arm in a horizontal position so that the torch cannot run "down hill." Carriage wheels on the right side have rounded faces, running in V-type rails, while those on the left side are flat, running on a flat rail. This is claimed to prevent binding and to assure both rolling freedom and accuracy. Wheels are adjustable radially for wear compensation. Timken roller bearings are used in the carriage wheels and are adjustable for axial play to eliminate lost motion. The arm is braced by four truss-rod supports and top and bottom cover plates. This arm is fabricated of aluminum alloy and heat-treated aluminum struts are used.

Wheels on the transverse carriage have rounded rims and run in V-type rails, like those on the right side of the table carriage.

Mechanism for starting, stopping, reversing, increasing or decreasing speed, including the control of manual operation for straight cuts for following drawings, is mounted on a single panel for one-hand control by the operator. Master-valve group controls for high pressure oxygen, low pressure oxygen and acetylene are provided at six places on the transverse arm and permit regulation from any location. Accurate cuts are possible, either parallel or at right angle to main guide rail, by locking the main carriage or transverse carriage in fixed relation to each other. Accurate circles are cut with a movable center plate and an adjustable trammel arm.

Torches are individually mounted on crossheads which travel the full length of the transverse carriage, always on a horizontal line. Vertical motion for the torch is controlled with accuracy by adjustable, replaceable gibs which hold the torch at a constant tension. Beveled cuts can be made to any desired angle by adjustment of the torch in its holder.

The No. 612 shape cutting machine has a cutting range 6 ft. wide by 12 ft. long and requires a floor space 14 ft. wide by 16 ft. long. Two smaller models, and special models to meet unusual service requirements, are available.

Westinghouse A. C. Welding Electrodes

"Crucible Weld" coated electrodes developed by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., are available in sizes from $\frac{3}{32}$ to $\frac{5}{16}$ in. in diameter. A special $\frac{1}{16}$-in. electrode is available for use with low current.

Electrodes come in two grades, black and brown. The black are claimed to be suitable for downhand butt welding and on surfaces where the slope is as much as 30 deg. They are heavily coated so that the deposited metal is protected during its cooling period by an easily removed coating. Physical properties are: 45,000-50,000 lb. per sq.in. yield point, 60,000-70,000 per sq.in. tensile strength, 25-35 per cent elongation in 2 in., 40-60 per cent elongation by free bend.

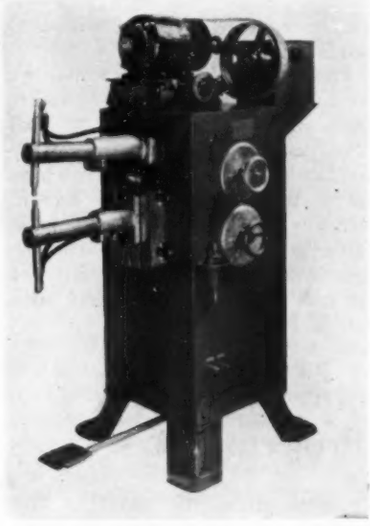
Brown electrodes are recommended for all general-purpose horizontal, vertical and overhead welding and are especially adapted for

fillets. They operate on open-circuit welding voltages as low as 50 volts. Physical properties are: 58,000-65,000 lb. per sq.in. yield point, 70,000-75,000 lb. per sq.in. tensile strength, 20-25 per cent elongation, 20-30 per cent elongation by free bend.

Eisler Heavy-Duty 35-Kva. Spot Welder

This 35-kva. capacity, heavy-duty spot welder, announced by Eisler Engineering Co., 770 So. 13th St., Newark, N. J., is of the fabricated-box type and is furnished with water-cooled electrode holders. The lower arm has a vertical adjustment to provide for work clearance.

An air-cooled transformer, equipped with dual switch control, is provided. There are twelve points of regulation. This unit is motor-



Lower arm of this 35-kva. spot welder is provided with a vertical adjustment. Electrode holders are water-cooled

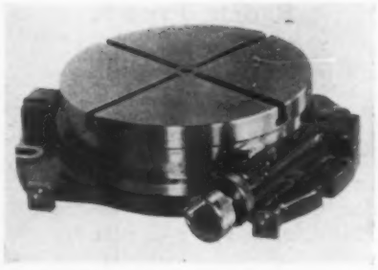
driven and is equipped with a clutch tripping device. A variable-speed unit can be provided for speed changes. Machine has capacity to weld a combined thickness of $\frac{5}{16}$-in. of steel or any steel-base metal.

Moore Rotary Table

A rotary table, designed for use with the Moore jig borer previously described (*AM*—Vol. 80, page 837), is announced by Marburg Bros., Inc., 90 West St., New York, N. Y., sole distributors for The Moore Special Tool Co., Inc., Bridgeport, Conn. This table has a semi-steel top, both seasoned and scraped. A hardened, ground and lapped bushing is inserted in the center, making it easy to locate a piece centrally on the table. The hole in this bushing runs concentric with the axis of the table within a limit of 0.0001 in.

In operation, this rotary table is swiveled rapidly to its approximate position, then a micro-adjustment is engaged and the final setting made by handcrank. It is claimed that holes can be spaced accurately within 0.002 in. on a 10-in. diameter.

The shaft and worm for making close adjustments of the table are mounted in an eccentric sleeve which has a knurled projector, permitting disengagement of the worm. The ratio is 180 to 1, permitting



Rotary table with micro adjustment, designed for use with Moore jig borer

fine adjustment. Table is graduated in half degrees with 720 divisions.

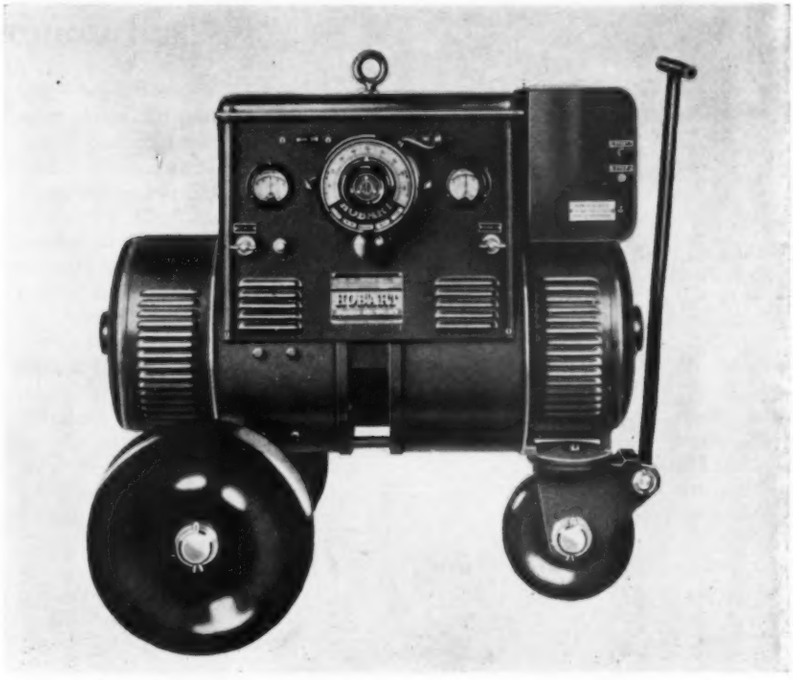
An angle plate for tilting the rotary at 90 deg. and an extension plate making it possible to locate holes on a circle as large as 22 in. in diameter are available.

Hobart Magnetically Controlled Welders

The line of arc welding units, featuring motor horsepower control, offered by Hobart Bros. Co., Canal Lock Square, Troy, Ohio, have been redesigned to operate magnetically instead of manually. Complete overload and under-voltage protection is provided. When the welding load is such as to require the full rated horsepower of the motor, the operator flips a small toggle switch to "high" position and presses the starter button. Motor then starts under reduced voltage and with about one-third the starting current usually drawn when starting across the line. As soon as the machine comes up to speed, the switch automatically changes over to the normal, full-load running position.

If one-half the rated horsepower of the machine is sufficient for the job at hand, the operator flips the toggle switch to "low" position. In this case, when the starter button is pressed, the machine starts and runs without changing over to the full-load position. It is claimed that this arrangement is equivalent to supplying two motors.

Magnetic control has been included in the line of Hobart arc welders



Radiac Type K Cut-off Machine

A two-speed motor is provided to give the abrasive wheel spindle of the Type K Radiac cut-off machine, announced by A. P. de Sanno & Son, Inc., 1615–1623 McKean St., Philadelphia, Pa., a high and a low speed. A crank handle on the electrical control box shifts the motor from high to low speed. Rubber-bonded or resinoid-bonded disks are used for cutting bars, tubing and formed shapes. These disks can be flooded with coolant at both high and low cutting speeds. A metal water tray that can be inserted in the vise table to catch dust and particles which accumulate during the cutting process is provided as standard equipment for this machine.

Coolant is supplied from a storage tank and pump located within the base of the machine and is directed on the wheel and material at the point of cutting. Work is held on both sides of the cut under spring tension. The lever for releasing the spring tension is used only when locating or removing work from the vise. All moving parts of the machine are balanced to eliminate vibration and insure smooth, clean cuts.

Two spindle speeds are provided for the Type K Radiac cut-off machine, which can be used for either wet or dry cutting

Either one of the following types of vise is offered as standard equipment: (1) a straight vise for straight cuts only, jaws open from 0 to 3½ in., or (2) a swivel vise for straight or angle cuts up to 45 deg., jaws open from 0 to 2 in.

Bar stock up to 6-in. in diameter may be cut when the Wells No. 7-B band saw is in a horizontal position

Wells No. 7-B Vertical Bandsaw

Nine speeds, ranging from 60 to 1,400 ft. per min., are provided for the No. 7-B vertical bandsaw, announced by the Wells Mfg. Corp., 315 Seventh Ave., Three Rivers, Mich. The upright frame is hinged at the bottom and may be released and fed into the stock automatically. Stock is clamped on the table with a vise, which is provided as standard equipment.

The upright frame also may be swung down to the floor, where gates and risers may be cut from large castings which are too heavy to place on the table. This machine has a throat clearance of 14 in. vertically and 14½ in. horizontally. Table is arranged to tilt 45 deg. right and 10 deg. left. Capacity of the saw when in a horizontal position is 14x18 in.

B. & L. Photo-Elastic Polarizer and Contour Projector

A photo-elastic polariscope and an improved contour measuring projector are offered by Bausch & Lomb Optical Co., Rochester, N. Y. The photo-elastic polariscope is designed for use in the study of stress distributions and strain deformations. This instrument makes it possible to demonstrate visually and record photographically the effect of stresses in an object of any shape.

In practice, a transparent model of the object under test is made, using a synthetic resinous material. The model is placed in the photo-elastic apparatus and loaded with weights simulating loads encountered in operating conditions sustained by the full size part.

With the polariscope, Fig. 1, the image may be observed on the ground glass of the camera, directly or by reflection, and numerous bands are seen across the model. The number and distribution of these bands provides an index of the direction and magnitude of the stresses. This photo-elastic analysis, supplemented by the use of the extensometer, enables the designer to determine the amount and direction of stress within the transparent sample. This instrument has been built with channel bars as bases on which the optical equipment is arranged. Length of base on the polarizing section is 5 ft. 2 in., while that of the analyzing and camera section is 8 ft. 6 in. Lens equipment is designed to insure a sharp image, free from distortion and color fringes.

The improved contour measuring projector, Fig. 2, provides a series of interchangeable 10X, 20X, 25X, 50X and 100X objectives that are

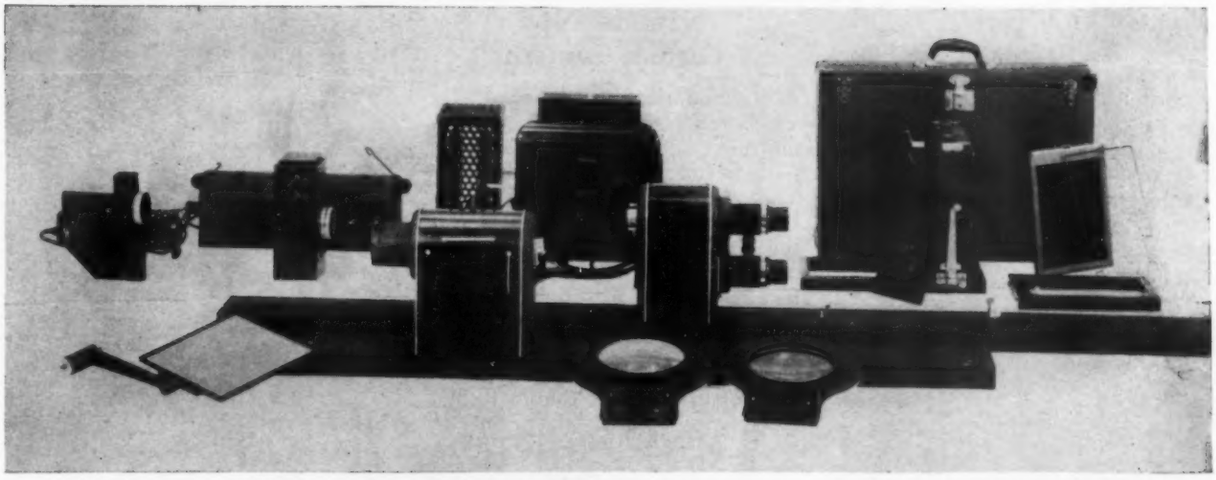


Fig. 1—B. & L. polariscope, before assembly, which is designed to demonstrate visually and record photographically the effect of stresses in transparent models

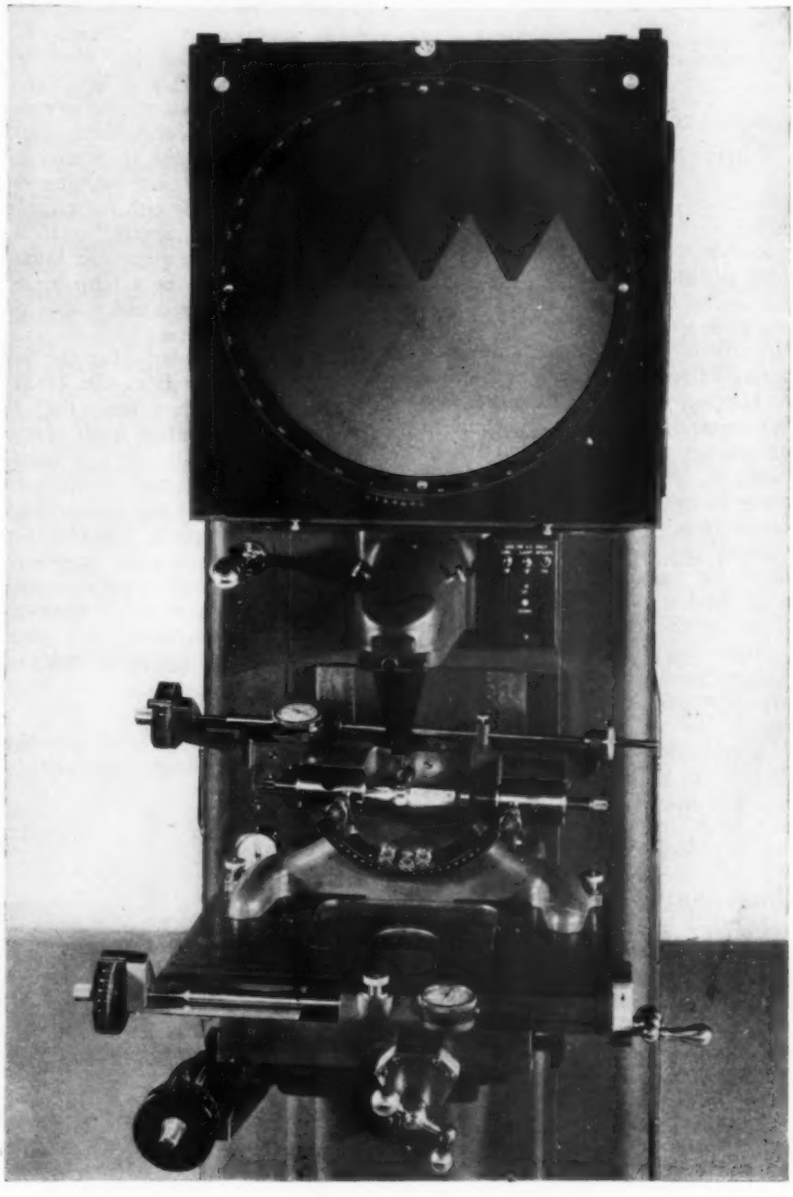
easily removed or inserted. Each objective automatically produces a screen image of the magnification rated on the objective. Objectives are practically parfocal, the object remaining in focus with a change of objectives.

A horizontal glass specimen plate, illuminated from below, permits objects to be held without other supporting means. Image as viewed on the screen is the same as the one seen when looking directly downward at the object.

Vertical motion of the specimen table is controlled by a reversible driving motor with mercury trip switches. A reducing gear with a ratio for focusing objects at a magnification of 100X is provided. Buttons outside the machine and within easy reach of the operator cause the table to move up or down.

The projector is provided with four interchangeable screens: an angle measuring screen, a plain ground glass screen, a book-type screen and a photographic plate screen. The angle measuring screen consists of a rotating circular disk of ground glass not less than 18 in. in diameter, mounted in a metal ring, the periphery of which is graduated in ½ deg. and is suitably numbered. Support for the ring carries a vernier graduated so as to permit a least reading of 1-min. of arc. Means are provided for rapid rotation of the screen and for fine adjustment. The ground glass screen carries a pair of fine-etched lines at right angles to each other, a pair of fine-etched lines at 60 deg. to each other, and a pair of fine-etched lines at 55 deg. to each other. Accessories are provided for the measurement of screw threads and hobs. Vertical illumination is available for opaque objects.

Fig. 2—A series of interchangeable objectives provides a magnification range from 10X to 100X for the B. & L. contour measuring projector



Selective-type three-in-one universal coilers, with standard equipment, will coil and cut all kinds of compression and extension springs from all sizes of wire within the specified range

Sleeper & Hartley Series 610 Universal Spring Coiler

Developed to provide a universal coiler with the accuracy of the segment-type coilers, the range of wire feed of the clutch-type coiler and the ability to be used as a continuous coiling machine, the No. 1, Series 610 selective-type universal spring coiler, announced by Sleeper & Hartley, Inc., 335 Chandler St., Worcester, Mass., will wind up to 95 springs per min. from 0.018 to 0.062 in. diameter wire. This machine is equipped with a gear box, eliminating the necessity for removing and replacing change gears in order to adjust the length of wire feed. A simple adjustment, throwing the cut-off out of action, permits the use of this machine as a continuous coiler. These coilers are equipped with Reeves "Vari-Speed" drive.

Specifications: wire sizes, No. 27 to No. 16; wire feed, 2¼ to 435 in.; inside diameter of springs, ⅛ to 1 in.; height of wire line from floor, 48 in.; floor space required, 25 x 31 in.; weight, including motor drive, 1,010 lb.; motor recommended, 1 hp., 1,200 r.p.m.

Three other sizes of this type of spring coiler are available. These are the No. 0, Series 609 with wire capacity from 0.004 to 0.020 in.; the No. 1½, Series 650 coiler with wire capacity ranging from 0.034 to 0.105 in.; and the No. 2, Series 651 coiler having wire capacity from 0.0342 to 0.135 in.

National NJ-1 Carbide Lantern

A carbide lantern designed for use by railroads and associated industries is offered by the National Carbide Corp., 60 E. 42nd St., New York, N. Y. It is equipped with a safety flame protector, heat-resisting glass lens and porcelain burner-tips. Of light weight to meet the requirements of car inspectors, the lantern can be used for 8 hr. on one charge of carbide. Features include an insulated handle to protect the workman against third rails and other exposed electric equipment.

Magnetizing Units for Magnaflux Inspection

Three magnetizing units will be exhibited by the Magnaflux Corp., 333 North Michigan Ave., Chicago, Ill. The Model K-3 unit has been developed for general use in locomotive shops for the inspection of side rods, valve motion parts and piston rods. It is applicable to the inspection of large shafts and for the examination of welded seams by either the cable or the "magnetic leech" method. This unit, Fig. 1, is a compact portable power unit having a transformer which operates from a line voltage of 220 volts, 60 cycle, a.c.

Designed particularly for the inspection of railway axles, the Model HC-1025 magnetizing unit, Fig. 2, is capable of supporting loads of approximately 3,000 lb. It is a transformer unit rated for intermittent service and having a maximum capacity of 5,000 amp. It provides for the examination of axles in which the location of both transverse and longitudinal defects are important. The unit is approximately 13 ft. long, 5 ft. high and 30 in. wide and will accommodate parts up to 10 ft. long.

Available in sizes having openings ranging from 48 in. to 12 ft., the battery operated Model AN unit, Fig. 3,

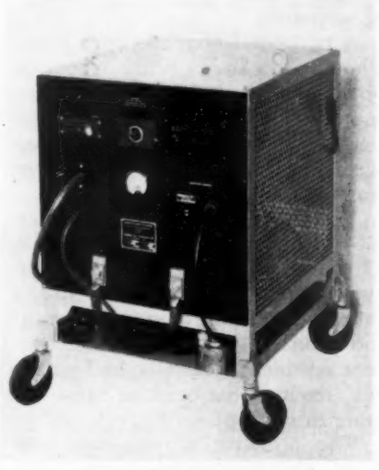
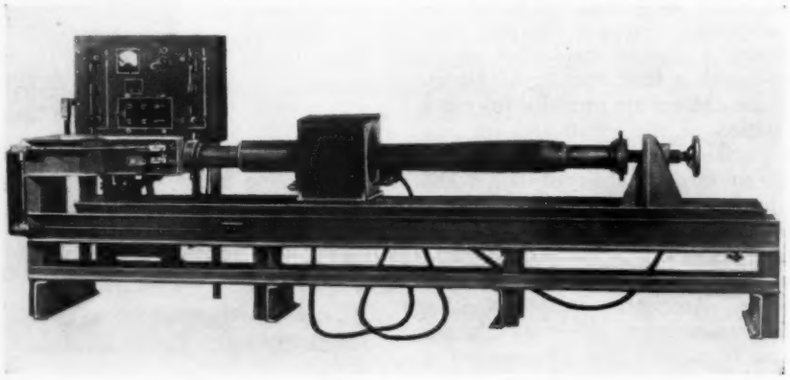


Fig. 1—The Model K-3 magnetizing unit is a portable outfit suitable for general inspection of large or small articles, which cannot be handled on a stationary bench-type machine

Fig. 2—Providing for the examination of railway axles for transverse and longitudinal defects, Model HC-1025 will inspect shafts up to 10-ft. long



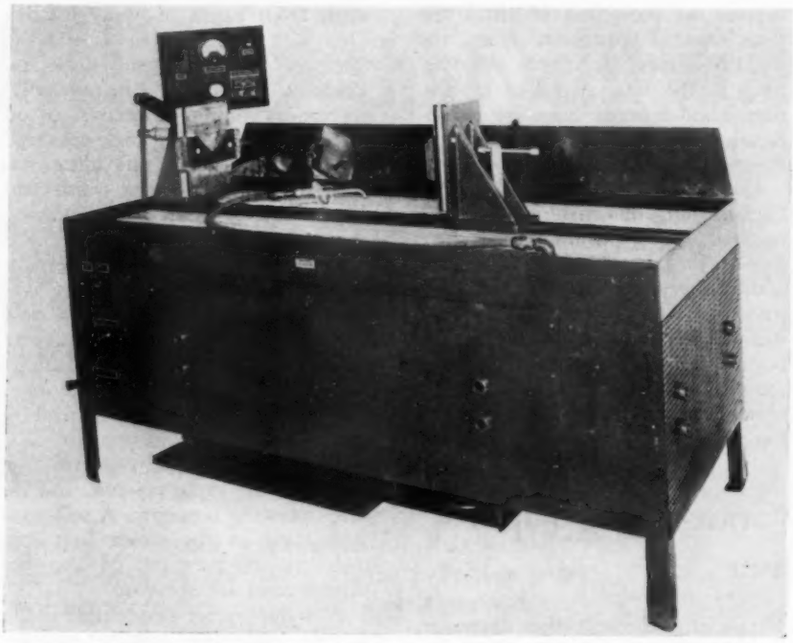


Fig. 3—Designed especially for the examination of aircraft parts, the Model AN Magnaflux inspection machine is battery operated. Detection liquid is stored in a tank in the body of the unit

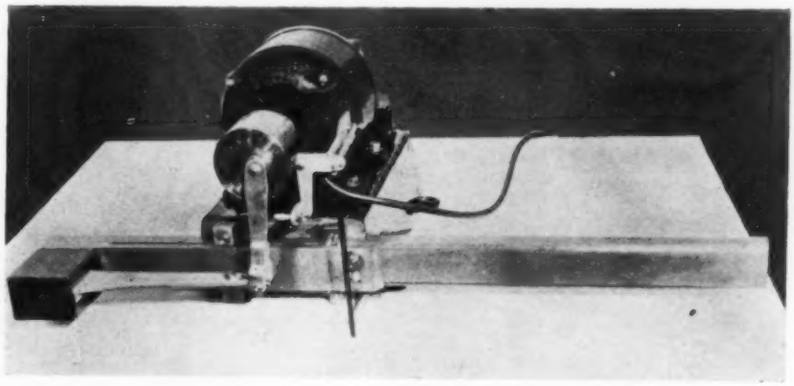
has a maximum capacity of 5,000 amp. This unit uses the wet method of inspection, which consists of flowing on the detection liquid after the part has been magnetized, and may be accomplished while the part is under inspection. The body of the unit contains a tank in which the liquid is stored and a pump which controls the flow of the liquid over the part under inspection.

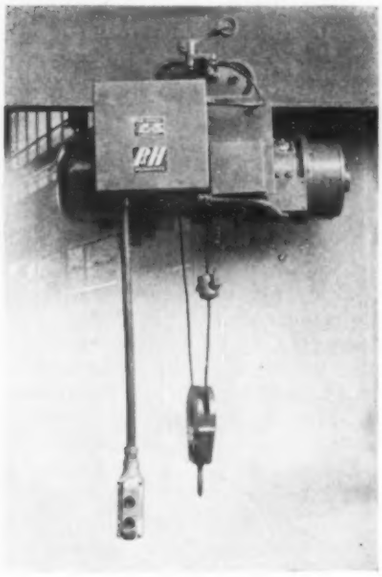
Krouse Fatigue Tester for Plate Metals

Designed to test metal sheet or plate, up to $\frac{3}{8}$ in. thick, at 1,750 cycles per min., using a cantilever-beam type specimen, the plate fatigue testing machine offered by G. N. Krouse, 101 E. Dominion Blvd., Columbus, Ohio, is of the fixed deflection type and uses the specimen and its own dynamometer. A $\frac{1}{2}$ hp. motor drives an adjustable-throw crank which has a stroke range from 0 to 2 in. This crank actuates a connecting rod pivoted at its lower end on a connecting pin and specimen connector bearing. The fixed end of the specimen is held in a vise which may be tilted to vary the range of bending from the completely reversed cycle of stress through any other range encountered in service.

This specimen vise is mounted on a movable bar which is clamped to the machine base by four screws and may be adjusted to take specimens varying in length from 4 to 24 in. In order to determine the deflection required to produce a desired stress, the specimen is clamped in the vise and its free end loaded at the connecting pin axis with dead weight calculated to produce that stress. The deflection is indicated by a pointer on the scale fixed to the machine base. The connecting pin is then replaced and the adjustable throw crank is set to produce the indicated deflection. A counter at the rear of the motor records up to 100 million cycles and an automatic switch stops the motor when the specimen fails.

Cantilever-beam specimens up to $\frac{3}{8}$-in. thick can be used in the Krouse tester





Push-button variable-speed control for electric hoist is shown applied to a 1-ton P&H Type R hoist

P&H Pushbutton Hoist Control

Push-button control equipment for P&H variable-speed electric hoists has been announced by Harnischfeger Corp., 4,400 W. National Ave., Milwaukee, Wis. This control eliminates the danger of pendant control ropes becoming tangled or twisted, thus causing motion in the wrong direction when the incorrect rope is pulled. The push-button element has five control steps and is fully magnetic. It is available for the entire line of P&H hoists.

Alox Rust-Preventives

Resulting from a process of oxidizing petroleum fractions under controlled procedure, a line of rust-preventive compounds has been announced by Alox Corp., Buffalo Ave. & Iroquois St., Niagara Falls, N. Y. Solutions of these compounds are available for dipping, spraying

or brushing on metal surfaces to produce thin, transparent, colorless and corrosion-resisting films. Series 701 compounds are recommended for use on ferrous metals and Series 702 for non-ferrous metals. It is claimed that these films are highly resistant to normal solutions of all acids and alkalies, and that they will stand temperatures up to 150 F. without dripping from the metal surfaces on which they are applied.

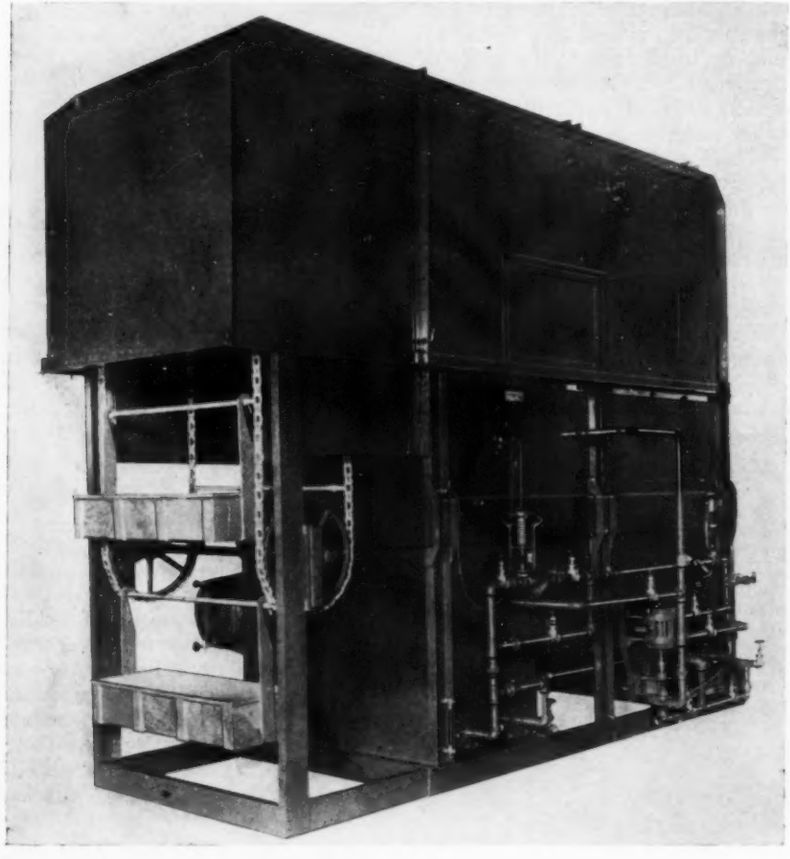
Films formed by these compounds range in texture from soft lubricating films to hard films that are extremely resistant to the penetration of moisture and sunlight. The soft-forming films are claimed to be useful for the protection of metal surfaces against corrosion from the time it leaves the metal manufacturer to the final stages of fabrication. Hard-forming films are recommended where coats are intended to be permanent.

One of the uses for which the hard-forming film material is recommended is as a priming coat, where it will form a water- and air-tight seal, either for the protection of smooth metal surfaces or roughened surfaces where corrosion has already begun. These films are easily removed by ordinary methods, using either alkaline washes or a degreasing system.

"Detrex" Automatic Vapor-Spray-Vapor Degreaser

This automatic vapor-spray-vapor degreaser, offered by Detroit Rex Products Co., 13005 Hillview Ave., Detroit, Mich., is equipped with a two-strand, cross-rod type conveyor arranged for loading and unloading at the same end. Work is placed in perforated baskets which are hung from the cross-rods of the conveyor. In passing through the degreaser, work is first lowered into the hot solvent vapors which thoroughly wet the work and remove part of the heavy contamination. Then, as the conveyor moves horizontally along the machine beneath the water-jacket condenser, clean warm solvent is pressure-sprayed onto the work from banks of spray nozzles. This mechanical action is claimed forcibly to remove and drive off solids. A final cleaning in pure solvent vapors completes removal of oil and grease. Returning back overhead to the loading and unloading station, the work emerges warm and dry, ready for subsequent finishing operations.

Miscellaneous stampings and other metal parts can be cleaned in this "Detrex" automatic vapor-spray-vapor degreaser prior to finishing or heat-treating



Steam coils are placed in the boiling sump and in the clean solvent distillate collecting sump. These galvanized steam coils are welded to removable clean-out doors. A vapor-actuated, air-operated control system, consisting of thermostat temperature indicator and valve, is used to regulate the heat input, control the height of the vapor column, and insure operating economy. A self-actuated valve in the steam line controls the temperature of the hot solvent used for spraying.

A water jacket condenser and a solvent collecting trough encircles the machine. This collecting trough is arranged so that the clean distillate can be made to flow into the spray sump at the right end of the degreaser or into the clean solvent storage tank at the back of the machine. Solvent that drains from the work, as well as the over-flow from the clean solvent spray sump, flows back into the boiling sump. The clean solvent storage tank is of sufficient capacity to hold all of the solvent from the machine during the distilling operation. In this way, contamination is removed and the solvent reclaimed for further use by distillation within the machine itself.

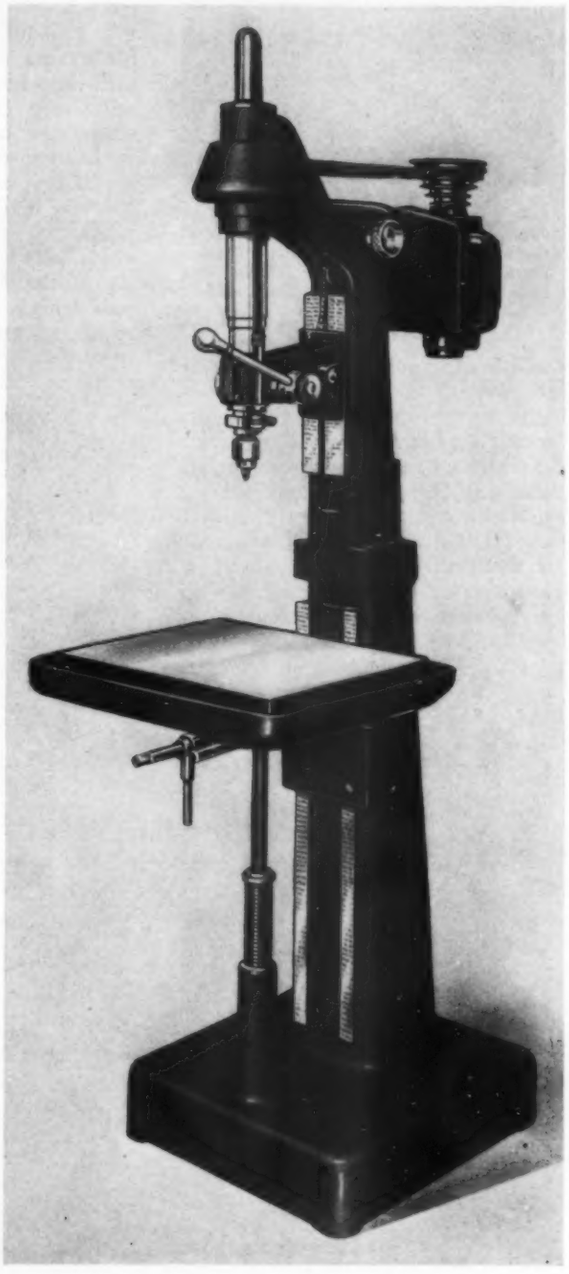
Rated production cleaning capacity of the degreaser shown in the accompanying illustration is approximately 3,000 lb. of work per hour at a normal conveyor speed of 6 ft. per min. The conveyor speed can be increased to 12 ft. per min., giving 6,000 lb. produced per hour. This unit is approximately 13 ft. long, 7 ft. wide, and 11 ft. high. Solvent capacity is 120 gal. Since this machine is too large to be exhibited at the Metal Show, a smaller hand-operated unit, embodying the same principles of design and operation as the larger unit, will be seen.

Cold-Forged "Parkaloy" Screws and Bolts

A line of hollow-head setscrews and socket-head capscrews and stripper bolts, cold forged from "Parkalov" chrome nickel alloy, has been announced by Parker-Kalon Corp., 200 Varick St., New York, N. Y. The

DRILLS that will make your men

PROUD OF THEIR WORK.



• Nothing is more disheartening to a skilled mechanic than to try to produce precision work on wobbly worn-out, or obsolete drill presses.

If you want your men to be proud of their work, give them these modern, high-speed, easy-to-operate "Buffalo" No. 14 Sensitive Drills. Spoilage will be much less, work will be accurate, production will be better.

Every detail has been included that will enable them to do their best work—5 spindle speeds, V-belt non-slip drive, ball-bearing spindles, sensitive hand feed. Available in both floor and table types.

Write for Bulletin 2726-B

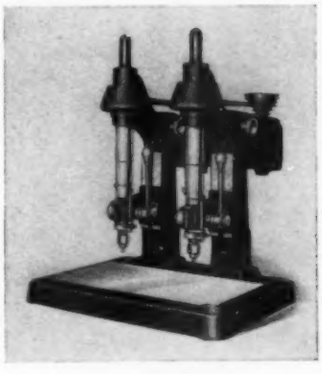
BUFFALO FORGE COMPANY

448 Broadway **Buffalo, N. Y.**

Branch Engineering Offices in Principal Cities

In Canada: Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo" **No. 14** *High Speed Sensitive* **DRILL**



BENCH TYPE

• Equally rugged in construction, this type is lowering drilling costs for many manufacturers. Available with 1 to 4 spindles.

FLOOR TYPE

• A modern drill for the modern plant. Rigid construction assures accurate work under varying pressures. Available with 1 to 6 spindles.

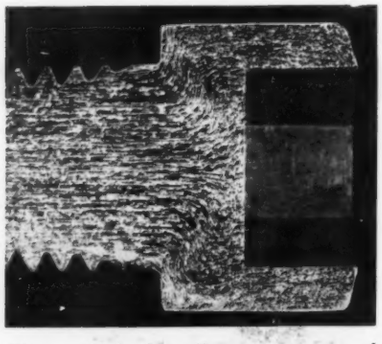


Fig. 1—Unbroken fibrous structure of cold-forged "Parkaloy" socket-head screws and bolts is illustrated in this photomicrograph. It is claimed that metal is concentrated at points subject to strains

cold-forging process used is claimed to produce an unbroken fibrous structure with concentration of metal at points subjected to strain, as indicated in the photomicrograph shown in Fig. 1. Uniformity of physical and metallurgical characteristics are claimed and each size and type is heat-treated. Flat-base sockets, illustrated in Fig. 2, are claimed to give better wrench engagement as well as increased head strength.

Class 3 fit threads are maintained on all sizes and types of these screws and bolts. Concentric heads and

Fig. 2—Better wrench engagement is claimed for the flat-base sockets in "Parkaloy" setscrews, capscrews and stripper bolts

clean starting threads are claimed. Cup, flat, cone, oval, half-dog and bull-dog points are available for standard hollow-head setscrews, which range in size from 0.112 in. diameter by $\frac{1}{8}$ in. long to $1\frac{1}{2}$ in. diameter by 4 in. long. Standard capscrews are made in sizes ranging from 0.112 in. diameter by $\frac{1}{4}$ in. long to $1\frac{1}{2}$ in. diameter by 6 in. long. Stripper bolts to suit varying conditions are listed in sizes having $\frac{3}{8}$ to $\frac{3}{4}$ in. shoulder diameter and 1 to 8 in. shoulder length.

Syncro Ten-Spindle High-Speed Fine-Wire Insulating Machine

Consisting of ten individual spindles mounted on one frame, this wire insulating machine is designed for serving wires of the finer sizes with the various insulations that are being used commercially and, also, several new types of insulations that are being developed. Built by Syncro Machine Co., 187 Sylvan Ave., Newark, N. J., the machine is provided with a frequency changer set which makes it possible to operate any of the flyers, independently of each other, at three different flyer speeds. These speeds are 3,300, 5,000 and 7,000 r.p.m. Each spindle or flyer is directly motor driven and is completely independent of the other units on the frame. They are spaced $10\frac{1}{2}$ in. apart.

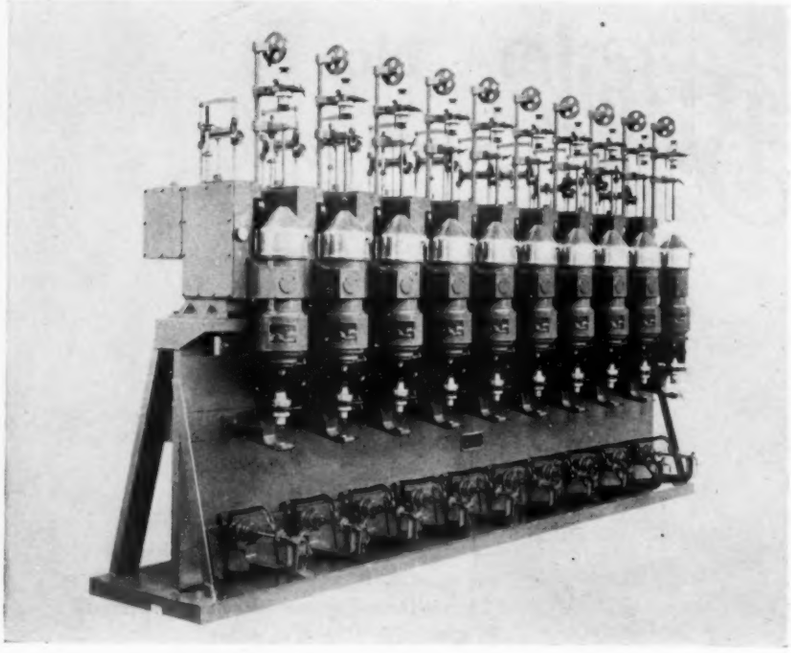
Each individual spindle is equipped with a pay-off unit, having an adjustable compensating tension device. Flyer disk is of the post type and is mounted directly on the flyer motor. This motor also drives the capstan, take-up and distributing mechanisms through worm and worm gear and spiral change gear combinations. Traverse stroke and lead are directly dependent on the revolutions of the take-up shaft with consequent accurate and even spooling.

Traverse guides are mounted with a vernier adjustment for accommodating the length of stroke desired. Further adjustments for centering the distributing movement with the various spools are also a part of the unit. Take-up is driven through a friction clutch which is operated in an oil bath.

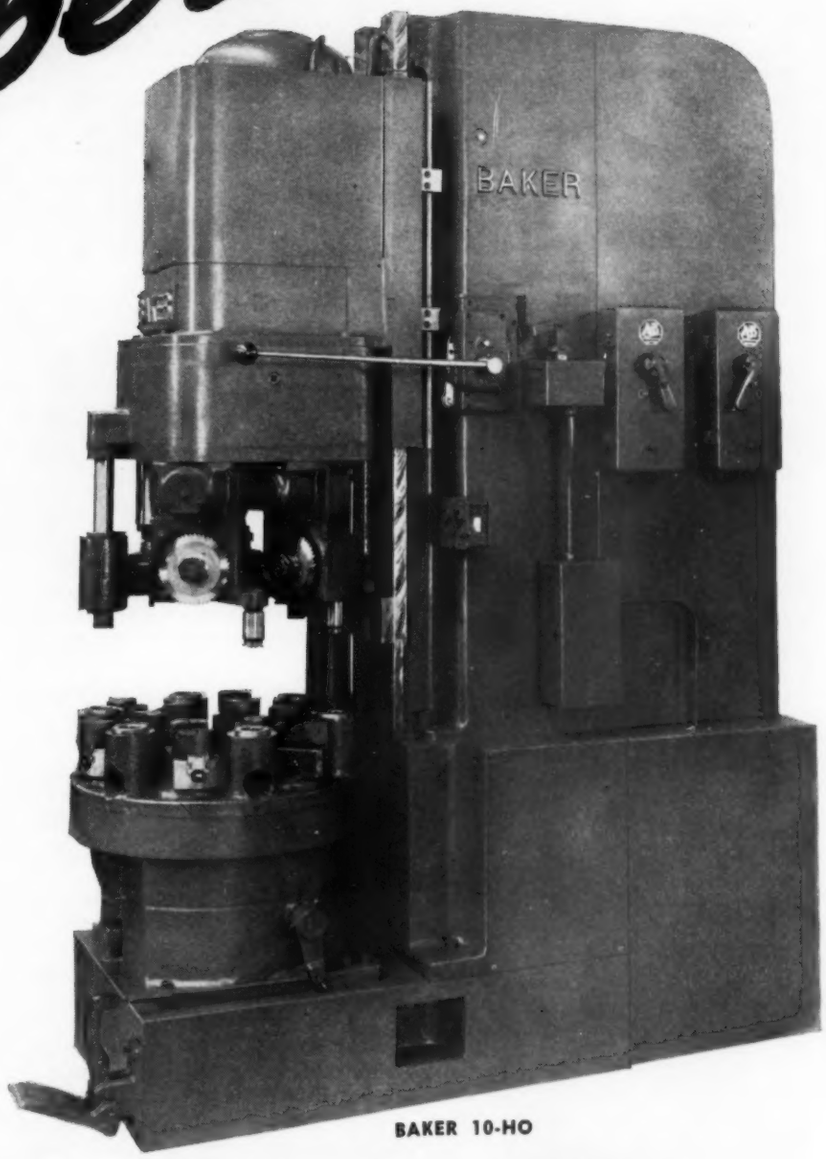
The machine is adapted to accommodate patented adhesive appliers, top coat appliers and an automatic stop. Each flyer is equipped with an adjustable cop tensioning device which offers constant tension at all times. Cops with a $\frac{5}{8}$-in. core diameter, 3-in. outside diameter, and $2\frac{1}{2}$-in. long can be accommodated. Cop holder is mounted on ball bearings and has an adjustable tension control. The supply magazine will accommodate three spare cops.

Supply reels are mounted on the front, directly below the flyer motor and approximately 4-in. off the floor. An adjustable tension brake is furnished as part of the supply reel mounting. The distributing mechanism is arranged for change gears for changing the lead depending upon the diameter of the wire being served. Gears for the take-up are interchangeable with those on the capstan. Take-up unit has an adjustable distributor and can be arranged to accommodate reels from $2\frac{3}{4}$ to 6 in. traverse and a maximum flange diameter of 6 in.

Each spindle of this wire insulating machine is completely independent and can be used economically to apply paper as fine as 1/16 x 0.001 in., cellulose film, glass yarn, silk, cotton and rayon insulations to wires of the finer sizes



Combine Operations



BAKER 10-HO

★ Baker machines are flexible and can be adapted to fit the job. This is the plus service that production executives expect from the new equipment.

The machine illustrated *mills two slots* in addition to drilling, reaming and facing operations. We do not manufacture milling machines but by adding two milling stations to this machine, we have provided the manufacturer with one machine which does the work of two—obviously saving manufacturing expense.

The flexibility of regular Baker machines for drilling, boring, reaming and tapping makes it possible for us to develop unusual applications. You may have a production problem that we can solve. Submit a blueprint or sample part for a prompt recommendation from our engineering department.

BAKER BROTHERS, INC.
Toledo, O., U.S.A.
Newark, N. J. office, 1060 Broad St.

★ BAKER ★

SHOP EQUIPMENT NEWS

Fellows No. 4B Gear Burnisher For Small, Fine-Pitch Gears

The Fellows Gear Shaper Co., Springfield, Vt., offers the No. 4B gear burnishing machine for finishing the teeth of small, fine-pitch gears. This machine, shown in Fig. 1, is electrically controlled in such a way that it is claimed to be impossible to bruise the teeth of fine-pitch gears. This is accomplished by bringing the gears to be burnished into rotative contact with the burnishing gears before pressure can be applied. Four idler and one driven burnishing gear make it possible to burnish two gears at a setting. Slides carrying the idler burnishing gears are independently operated, so that two gears of different diameters can be burnished at the same setting.

Work, when being burnished, is held on studs which locate it in the proper relation to the burnishing gears. For the ordinary run of work, these supports are held in adjustable bars located in the slides. For very small gears, special supports are used. Adjustable swinging supports are employed to prevent endwise movement of helical gears.

Fig. 1—Fellows No. 4B gear burnishing machine for small fine-pitch gears

Time of burnishing is automatically controlled by adjustable timing relays having a range of from 3 to 40 sec. These relays are independently adjustable, permitting burnishing longer in one direction than the other, if so desired. It is claimed to be possible to burnish gears at a rapid rate; a 4-in. diameter, $\frac{1}{16}$-in. face gear can be handled at the rate of 480 per hr.

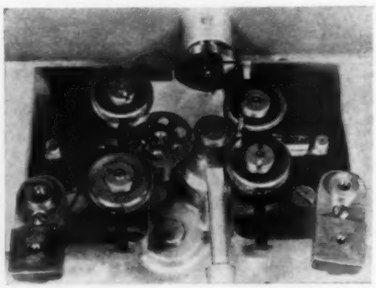
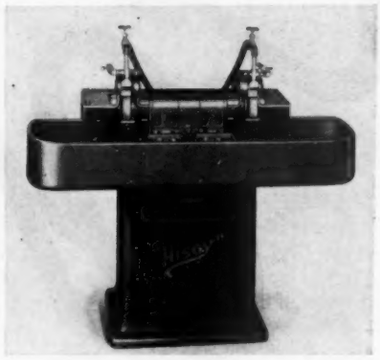


Fig. 2—View of set-up of Fellows No. 4B gear burnisher to finish two gears of different diameters at one setting

Maximum capacity of the machine is a gear 4-in. pitch diameter, 20 diametral pitch.

Fig. 2 shows idler burnishing gears held on adjustable studs, the position of which relative to the driver burnishing gear is controlled by a cam and adjustable cam bars. Cam and cam bars set the slides so that the gears to be burnished, when in the loading and unloading position, are in mesh with the burnishing gears with sufficient backlash to permit easy insertion and removal of the work. When the operating lever is shifted to the burnishing position the cam is relieved from the cam bars, allowing weights at the rear of the machine to apply the necessary burnishing pressure.

Specifications: Over-all length of machine, 3 ft.; over-all width, 28½ in.; over-all height, 42 in.; net weight, equipped with motor, 1,100 lb. Standard equipment includes a lubricating pump and necessary weights.



Hisey Two-Wheel Wet Grinder

Made in three sizes, for 10-, 12- and 14-in. diameter wheels, these two-wheel wet grinders, offered by The Hisey-Wolf Machine Co., Cincinnati, Ohio, are designed for use with motors of any electrical characteristics. A constant stream of coolant is supplied directly on the work and a separator removes all grit before returning the water to the reservoir. Flow of coolant is controlled by a convenient valve on top of the guard. Pump is self priming and is driven by V-belt from the spindle. Main drive is also by V-belts, permitting spindle speed to be easily changed.

Davis Protective Clothing For Gas and Arc Welders

A line of protective clothing for welders, complete for both acetylene and arc work, has been announced by Davis Emergency Equipment Co., Inc., 55 Van Dam St., New York, N. Y. This line includes goggles, sleeves, aprons, leggings, spats, and gloves for acetylene welding. For arc welding it includes: helmets, hand shields, sleeves, aprons, coats, pants, leggings, spats and gloves. Goggles, helmets, and hand shields are equipped with glasses of various shades, each suitable for a special type of work. There are five different shades of goggles, ranging in use from light brazing to heavy welding, and three different shades of glasses.

"MAIN STREET ... MY FOOT"

That's exactly what Bill Kaffrey said before he saw the book. Above you see Bill, comfortably seated at the general foreman's desk, reading rhymes about ... of all things ... lathes and getting a bookful of lathe "low-downs" that intrigued, surprized, fascinated Bill to ponder: "Why the---- hasn't someone talked about lathes like this before?" Bill may or may not have the final say about company purchases ... but he knows his lathes outside-in and inside-out. Even hard-boiled Bill admits that "What Makes Main Street," not only gave him a better conception of his job ... but an entirely new "lathe's-eye" view of his own particular niche in the parade of production.

"What Makes Main Street" ... isn't written for just the Bills of the production line. It's written for everybody from the boss to the apprentice. It's a shop book for everybody from the men who spell PROFIT—p-e-r-f-o-r-m-a-n-c-e. An interesting book ... a colorful book ... a downright valuable book. You get a copy, via the coupon, for a quarter of a dollar. It's worth it.

The R. K. LeBlond Machine Tool Co.
Cincinnati, Ohio. Dept. H-1

Here's my quarter ... send the book.

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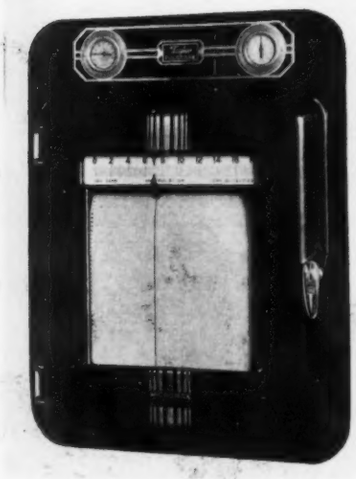


Taylor "Fulscope" Micromax Controller

The "Fulscope" Micromax controller, an air-operated potentiometer controller for process problems where smooth, proportional valve action is imperative and the potentiometer principle of temperature measurement is preferred, has been announced by the Taylor Instrument Companies, Rochester, N. Y. This instrument utilizes the same adjustable, air-operated control mechanism that has been used in "Fulscope" temperature, pressure, rate-of-flow, and liquid level controllers. Temperature measuring system is the "Micromax" recording and indicating potentiometer manufactured by Leeds & Northrup Co., Philadelphia, Pa. All functions affecting accuracy of temperature measurement are claimed to be fully automatic.

The Fulscope control unit operates in conjunction with the Taylor "Motosteel" diaphragm valve. Where precision valve action, or both precision valve action and compensation for changes in loads may be necessary to prevent deviation from the control point, the Fulscope control mechanism can be supplemented with the "Valv-Precisor" or "Dubl-Response" control unit.

Durez No. 77 SB Inert Plastic

Durez 77 SB molding material, offered by General Plastics, Inc., North Tonawanda, N. Y., is claimed to be an inert material suitable for products that must function in corrosive chemicals. It is also claimed to resist frictional wear and to permit machining operations without impairment of its water- and chemical-resistance properties.

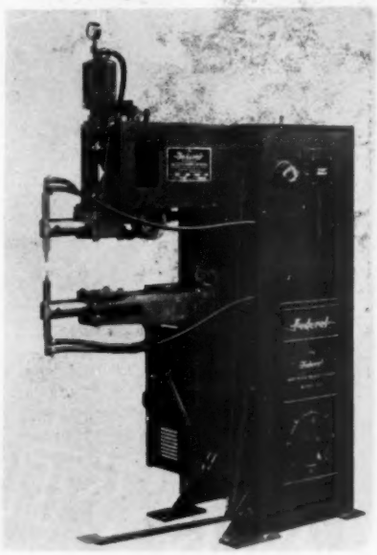
Federal Type P-1 Spot Welders

Listed as the P-1 Series, a line of press-type spot welders has been announced by The Federal Machine & Welder Co., 212 Dana Ave., Warren, Ohio. These welders are available in six capacities ranging from 20 kva. minimum to 75 kva. maximum. Three different types of pressure devices are available, namely direct air pressure, direct cam pressure, and air and toggle pressure.

The illustration shows a welder of the P-1 series equipped with an air and toggle pressure device. The horns shown on this machine are standard water-cooled type electrodes, but universal-type horns with electrodes placed at an angle can be furnished.

Lower horn socket is adjustable to right or left in order to facilitate the use of offset points when required. It is also adjustable approximately 8 in. vertically.

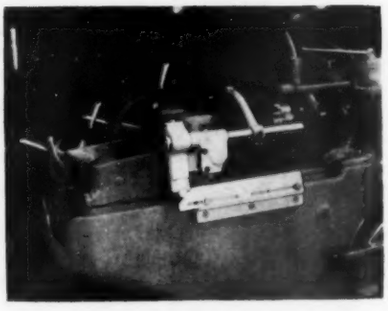
Welder is operated by means of a foot lever, which trips the clutch switch which in turn, engages the worm gear train. This train consists of a fractional-hp. motor, Reeves Vari-Speed transmission, giving 3 to 1 ratio adjustment, through a worm-gear which operates a pitman and in turn operates the toggle device. Toggle is cushioned by an air cylinder to insure uniform pressure and to avoid hammering the tips. The welder can be operated electrically by means of a cam on the end of the drive shaft. This cam operates a contactor panel or timer through a limit switch. All welders of this series are equipped with 8-point regulator switches by means of which the secondary voltage and current can be adjusted to suit the work at hand.



Automatic Work Stop for Landis Threading Machines

An automatic work stop, designed for use on the "Landmaco" threading machine, has been announced by Landis Machine Co., Waynesboro, Pa. This stop may also be applied to all standard Landis threading machines that employ a Model A carriage front. The unit is fully automatic in action and is claimed materially to improve production as time is saved when a number of similar pieces are to be threaded. It may be used to advantage where it is desired to locate stock in the same relative position for threading, and it is applicable to operations where the thread is close to a shoulder.

A bracket, fastened to the end of the carriage front, supports a horizontal shaft on which a stop arm is mounted. This arm is adjustable on the shaft for any distance up to the length of the carriage travel of the machine. The end of the shaft nearest the operator is fitted with a pinion gear that engages in a vertical rack gear. A cam fastened to the bed of the machine is used to actuate the movement of the stop arm as the



carriage moves forward or backward. A roller on the end of the rack gear operates on the cam to reduce friction between the cam and the rack gear.

This cam has elongated slots that make it adjustable to any position. When the carriage is back or in position for loading and unloading, the stop arm is down. After the piece to be threaded is gripped in the vise, the cam is set so that the stop arm raises with the first forward movement of the carriage. This eliminates the possibility of the arm striking the head.

TOPS *in* SPEED, ACCURACY, *and* ADAPTABILITY

OSTER THREADING EQUIPMENT WILLIAMS

Designed and engineered from the base up to be the all-star performers in their field, Rapiduction Bolt Threaders of the "900" series are proving their superiority wherever installed. Built in two sizes, 3/8" to 1 1/2" and 1/2" to 2 1/4", in double and single spindle designs, these machines not only handle all standard jobs but, because vise and carriage are free from obstructions, are particularly adapted for the application of special fixtures for holding unusual jobs.

Write today for special bulletin.

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Threading Headquarters Since 1893

RAPIDUCTION BOLT THREADER

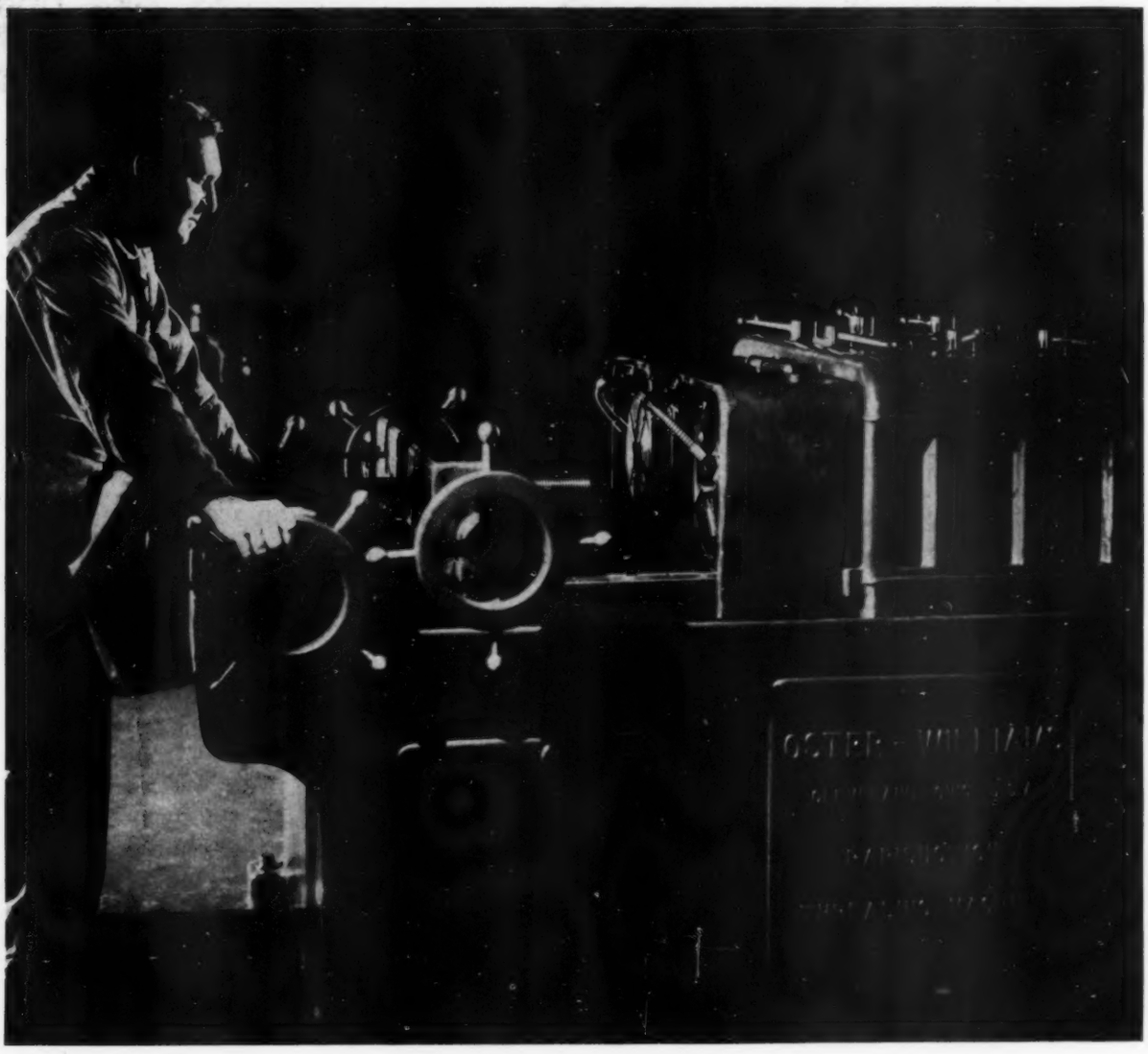


Fig. 1—The author is shown inspecting work racks in the laboratory installation for practical trials of plating solutions and processes on factory production samples

Process Control of Production Plating

Standard electroplating methods are developed and tested in the laboratory before they are applied to production work; solutions are checked regularly to maintain efficient conditions

WALTER R. MEYER
Electrochemist, Bridgeport Works, General Electric Company

FOUR decentralized divisions, each producing a wide variety of products, are embodied in the Bridgeport Works of the General Electric Company. Each of these divisions is set up to produce the major portion of the plated finishes required in the manufacture of its products.

A modern, well-equipped research, development and control laboratory tests outside developments in electroplating practice, works out improved methods of production plating and is charged with the control of operating solutions throughout the plant. This laboratory employs an electrochemist, an assistant electrochemist, two solution control chemists, a spectroscopist and several chemists for special developments.

Practical Trials

New processes are first worked out on a small scale in three-liter glass cells and then tried out on a small-quantity production basis in the experimental plating installation shown in Fig. 1. All operating details are carefully determined in these tanks before the new or improved process is introduced in the production department. Apparatus seen in the foreground is used in determining the thickness of zinc or cadmium coatings by the drop method.

Cleaners, pickling baths and plating solutions are analyzed by laboratory chemists at least once a week, oftener if the solution is used on more than one shift. This strict control pays for itself many times over by minimizing rejects caused by

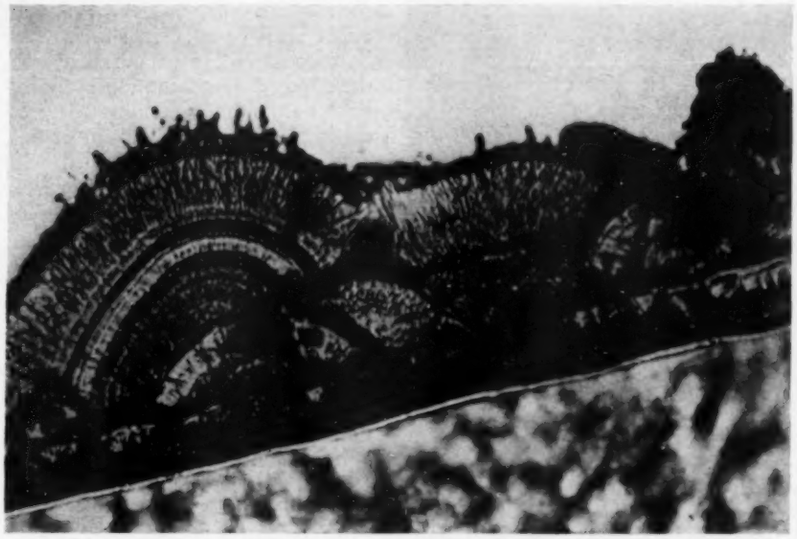


Fig. 2—Photomicrograph shows the banded structure of a copper coating plated from a solution containing 1 g./l. of lead; such a coating is pulverent, weak and valueless

faulty solutions, holding quality of product constant, insuring constant anode corrosion and preventing excessive loss of solution by drag-out because of unnecessarily increased concentrations. This last factor is often overlooked, since most solutions will operate satisfactorily at high concentrations, but will have high drag-out losses, especially if work containing large pockets is being plated.

In addition to the control of solutions, analyses are made of purchased raw materials, such as anodes, plating solution salts and the metals which are to be plated. Faulty metal having rolled-in scale inclusions can cause untold difficulties, particularly on cold rolled steel.

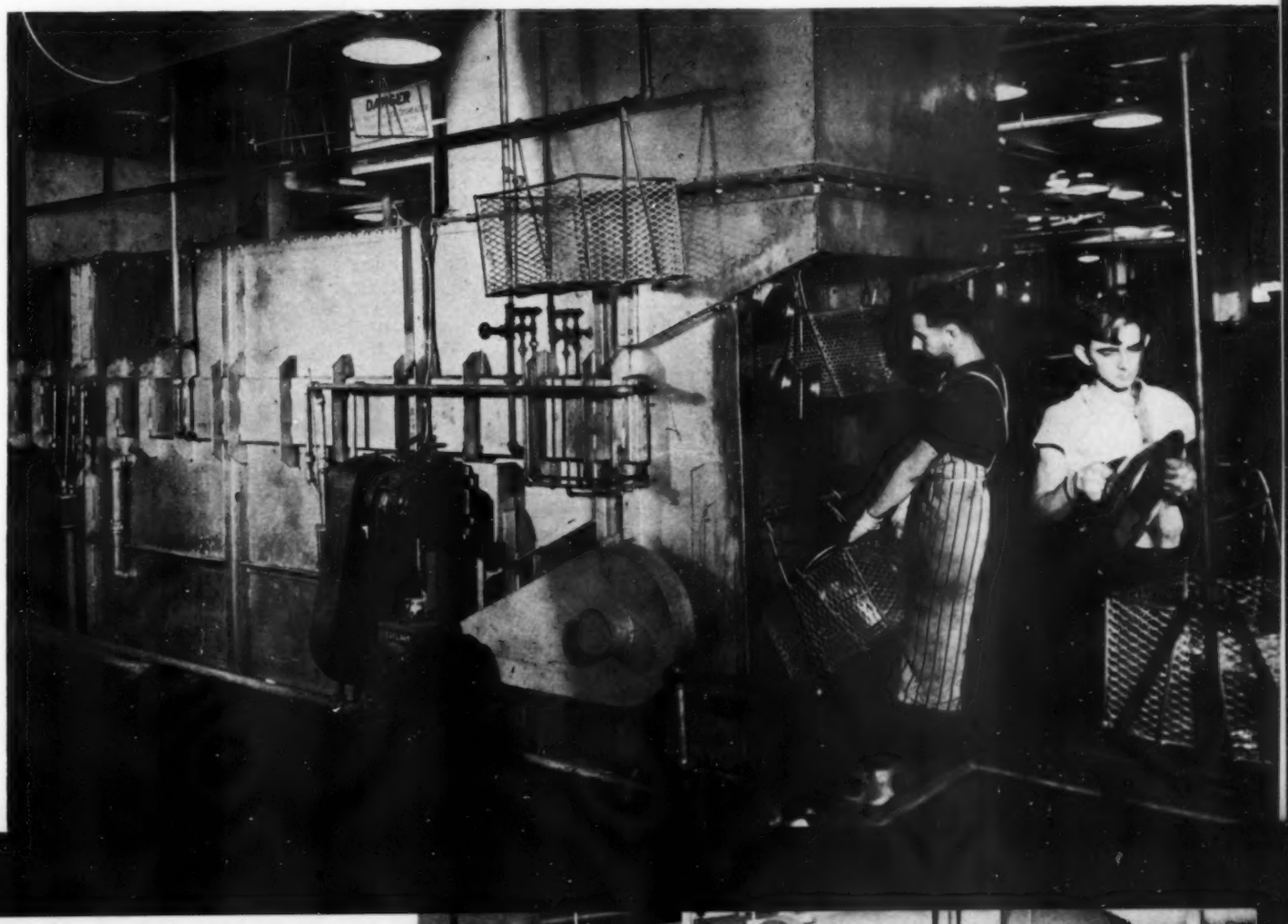
With increased business activity and the attendant difficulties of obtaining materials, the checking of incoming salts becomes more necessary. Often minute quantities of impurities can cause major plating difficulties.

Lead is particularly bad in cyanide plating solutions such as copper, zinc, and cadmium. As little as 0.05 oz. per gal. of lead in a copper solution will ruin the deposit and amounts as small as 0.0007 oz. per gal. will still have a noticeable effect on the brightness and ductility of copper deposits. This effect is shown clearly in Fig. 2, which is a photomicrograph having a magnification of 1,000 X, indicating the pulverent, weak and banded structure of a valueless copper coating plated from a solution containing 1 gram per liter of lead.

Daily checks are made on plated goods to insure uniform quality of the product. Thickness measurements and accelerated corrosion tests are used for this purpose. For zinc and cadmium deposits, thickness determinations are made by means of drop tests. These are rapid and permit determination of thickness of coatings over significant surfaces inside and outside the object.

Nickel and nickel-chromium coatings are checked daily for thickness with a metallurgical microscope and are subjected to an eight hour 20 per cent salt spray test. When the goods

Fig. 3—Discharge end of three-compartment, full-automatic degreaser installed in Home Appliance Division for cleaning a wide variety of parts



are to be sent to tropical countries, coatings are tested in a 100 per cent humidity room maintained at 100 F.

Radio Part Plating

Zinc, cadmium, tin, nickel, chromium and copper electroplated coatings are applied to various component parts in the Radio Receiver Division. Most of these parts are of steel, hence the most suitable deposits are either zinc or cadmium. Up to about two years ago cadmium was commonly used, principally because of the ease with which soldering could be done when using non-corrosive soldering fluxes. Also, zinc deposits obtainable at that time were dull and had an extremely unsatisfactory appearance.

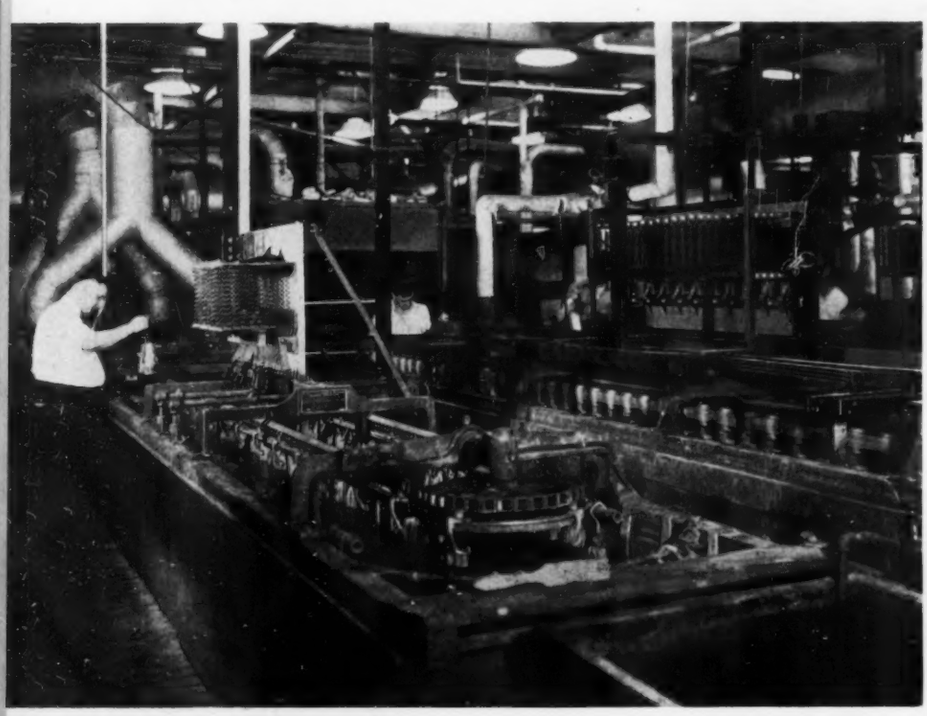


Fig. 4—Work delivered from the cleaning and pickling machine, is fed manually to these two semi-automatic nickel plating units

Development of methods for producing bright deposits of zinc now makes possible zinc plating of radio receiver parts with finishes that compare favorably with those of bright cadmium. The joining of the various ground wires to the chassis has been solved by the development of spot resistance welding units using flexible leads and having close control of current input and welding time.

Bright zinc plating is done in a full-automatic machine using from 30 to 40 amp. per sq. ft. and having a plating time of six min. Conveyor speed, in this machine, is unusually high for automatic plating, being 70 in. per min. and delivering 550 racks per hour. This results in a production of from 1,100 to 1,600 plated chassis units per hour.

Work is hung on universal, hard-rubber coated racks, which are carried by conveyor through the following operation sequence: (1) emulsifiable solvent dip, (2) cold water pressure spray rinse to sewer, (3) cathodic alkaline cleaning, (4) cold water rinse with spray, (5) acid dip—partly electrified anodically, (6) cold water rinse with spray, (7) anodic cyanide dip, (8) bright zinc plate, (9) cold water rinse with spray, (10) bright dip, (11) cold water rinse with spray (12) hot water rinse, and (13) hot blast drier.

Barrel bright zinc plating is also being produced satisfactorily and the finish is comparable to that of cadmium. From seven to nine volts are required to pass from 200 to 300 amp. per cylinder. Cooling coils must be installed in the tanks to prevent over-heating because of the high current passed. "Throwing power" of bright zinc solutions is better than that for cadmium solutions and good distribution of the deposit is obtained, even over irregularly shaped objects.

Zinc plated parts do not develop the blue-black tarnish that is common on cadmium plated parts when stored in poorly ventilated spaces. However, zinc reacts readily with moisture to form white salts. It also reacts with either acids or alkalies, such as may be encountered in perspiration from the hands during handling by operators or from the fumes normally present in plating rooms. Because of this, zinc plated parts are handled with gloves wherever feasible and finished work is removed from the plating room as quickly as it is plated.

Wiring Materials Plating

Most of the component parts for switches, lamp holders, fuses, plugs and similar products that require plating in the Wiring Materials Division are small, hence the plating operations are chiefly barrel plating, burnish rolling and bright dipping.

Plating barrel installations are constructed in four-barrel units, with two rinse compartments, all driven from a common shaft. Transfer of barrels between compartments is made by a push-button controlled electric hoist, mounted on rails above the tanks. Such plating units are installed for copper, brass, bronze, cadmium and nickel plating operations. Zinc plating is performed in three 2,000 gal. semi-automatic units.

An interesting process in this department is the application of a bright deposit of tin without using an external electric current. This finish is used on inexpensive copper, brass and bronze objects, such as fuses and plugs. These parts are placed in an aluminum basket and are then: (1) bright dipped in the usual solution, (2) rinsed in cold water, (3) dipped in a three per cent sodium cyanide solution, and then (4) immersion tin dipped. The entire sequence of operations requires no more than three min. to complete. Shells so plated have a bright tin finish with a tarnish resistance higher than that of either zinc or cadmium. This finish cannot be used in place of zinc or cadmium coatings on steel, where a sacrificial protective finish is desired.

Conduit boxes and fittings are plated in a semi-automatic zinc plating tank, after having been cleaned and pickled in an automatic screw-type unit. Where a heavy, uniformly deposited zinc coating is specified, these parts are being hot-galvanized.

Home Appliance Parts

Copper, nickel, chromium, tin, zinc, cadmium, silver, gold and brass electroplated finishes are applied to component parts of fans, kitchen mixers, sun lamps, heaters, percolators, toasters, waffle irons and similar household appliances in the Home Appliance Division. Steel component

parts to be plated, as well as all work to be lacquered or enameled, are cleaned in a three-compartment degreaser, Fig. 3. The three compartments contain boiling trichlorethylene, clean condensate and hot, clean vapor, respectively. Large objects are hung from hooks carried through the machine by the conveyor.

After being cleaned in the degreaser, the work is sent through an automatic alkaline cleaning and acid dipping machine containing (1) a cathode electrocleaner, (2) cold water rinse, (3) hydrochloric acid pickle, (4) cold water rinse, (5) sodium cyanide dip, and (6) cold water rinse. From this point the work is transferred manually to two 2,000 gal. semi-automatic nickel plating tanks, shown in Fig. 4.

Solutions used in these tanks are of the warm Watts type, containing nickel sulphate, nickel chloride and boric acid. They are operated at a pH of from 5.0 to 5.6, with a current density of 25-35 amp. per sq.ft., sufficiently long to deposit from 0.0007 to 0.0010 in. on steel and from 0.0005 to 0.00075 in. on nonferrous metals.

Chromium plating is performed in the set-up shown in Fig. 5, which is similar to usual installations except for the four-compartment control of current, using the same solution in each compartment. Work to be chromium plated is (1) racked, (2) cleaned, (3) rinsed, (4) dipped into dilute sulphuric acid, (5) rinsed and then (6) chromium plated.

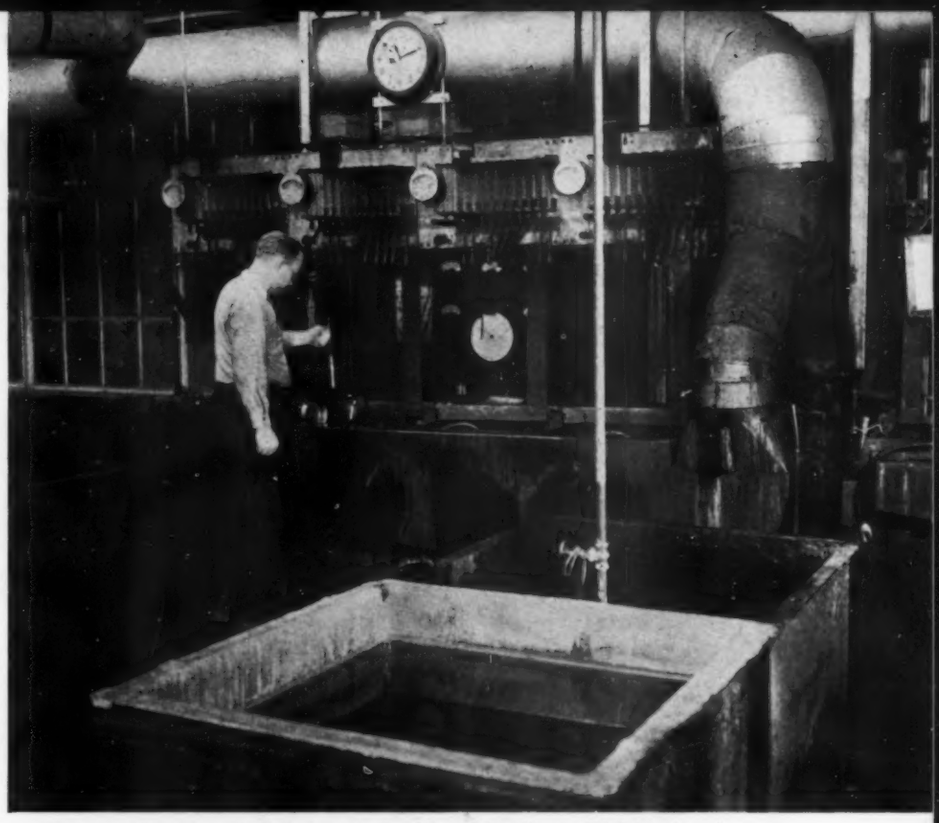
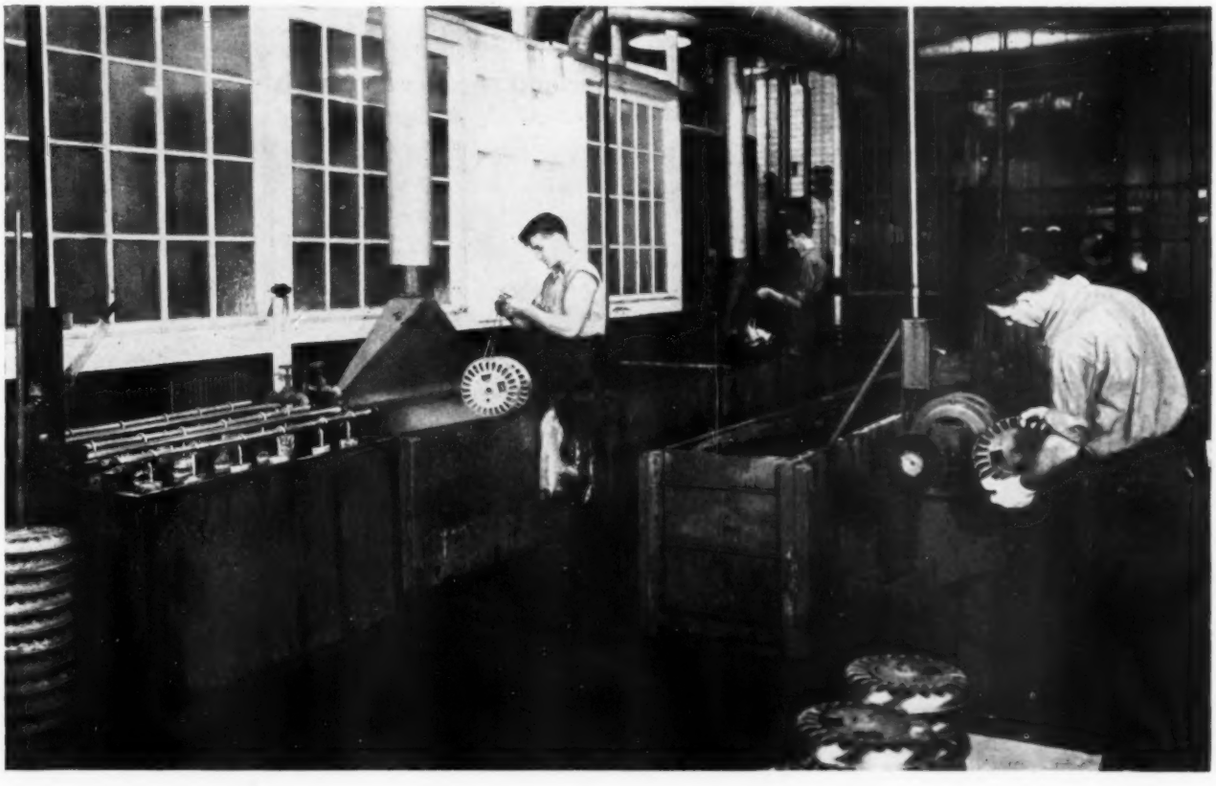


Fig. 5—Chromium installation in the Home Appliance Division has four-compartment current control and uses the same solution in each compartment

A portion of the Home Appliance Division plating room, Fig. 6, is reserved for producing oxidized finishes, chiefly on brass-plated sun lamp bases. A brass plating installation is seen at the left foreground and, at the right, an operator is wire brushing a base after it has been oxidized by alternate immersions in dilute copper sulfate and sodium polysulfide.

Fig. 6—Oxidized brass and other electrodeposited brass finishes are produced in this portion of the plating room



Portable grinding equipment gives high-price polish to low-cost stainless steel

Luster for Stainless

Improved rolling methods make a steel which is easier and cheaper to polish

R. R. CURRY
Superintendent, Stainless Steel Production
The American Rolling Mill Company

IN THE LIFE of every new product of the metallurgists' laboratories, there comes a time when fabricators find ways to lower finishing costs. Raw materials are definitely linked with market prices, but science and skill combined with trial and error finally effect definite savings.

Improvements in the production of stainless steel have banished the dollar-a-pound days. As stainless usage grows the price trend may be correspondingly downward, but for the present at least, manufacturers can effect no substantial additional savings because of a stable or slightly rising market in the necessary raw materials and higher labor costs.

Therefore, the real reason for today's lower cost of stainless steel articles lies in improved cold-rolling methods. These make it possible for fabricators to buy unpolished stainless steels of best quality and do their own finishing and polishing.

Stainless Ribbons

Advances in methods of cold-reducing stainless steels on continuous mills is probably among the most significant steps yet recorded in furthering the uses of this aristocrat of ferrous metals. Until recently, all stainless sheets were manufactured by the old sheet bar method of rolling. But today, most mills are patterned after the continuous mills invented by Armco in 1923. Producers have found a way to run stainless steel through a series of wide cold-reducing mills stationed in a continuous straight line. From them emerges a wide stainless steel ribbon hundreds of feet in length and rolled to the specified gage.

The result is a superior type of grain structure, a greatly improved surface and a sheet that may be polished at less cost.

These new cold reduction mills have effected such great improvements in the surface qualities that fabricators can buy ordinary cold rolled stainless and do their own polishing and finishing at about half of their former costs.

A few grinding operations, for

instance, will bring an Armco 2B finish up to standard No. 4 polish. The slightly milky or cloudy shade of the cold reduced 2B finish can easily be removed by a single buffing operation which produces a high luster finish.

One of the first things to consider in polishing stainless steel is its low heat conductivity. Care must be exercised to prevent overheating with subsequent warping of the metal. Therefore, the speed of polishing wheels must not be too great nor should they be applied with too much pressure. Since stainless steels are much harder than other bright metals, the removal of a lighter surface film must be expected with each passage of the wheel.

Free Wheeling

Operators have found that portable grinding equipment is highly satisfactory. It is preferable that a free-cutting wheel be used for the first grinding operation. It should be made of sewed muslin and headed up with the desired grain size, using either glue or grain cement.

Tests have shown the speed of wheels for rough grinding should be approximately 3,000 to 4,000 surface ft. per min., and for buffing about 9,000 to 10,000 surface ft. per min.

In selecting the first abrasive material, the choice depends almost entirely upon the condition of the surface to be polished and the type of finish required. Care should be exercised in beginning with a grit that is coarse enough to reach the bottom of all pits and scratches, thereby saving considerable time and material.

It has been found that a No. 80 grit generally is coarse enough for the start of polishing on a No. 1 pickled finish sheet. This is usually followed by No. 100 grit. The surface should be rough ground until all scratches, pits and other surface blemishes have been removed. It is suggested that the No. 100 grit be followed with commercial grease stick grind using a No. 120 grit to remove No. 100 grit lines. The selection of finer grits to produce the desired finish then depends upon the skill and judgment of the operator.

Where Armco 2B cold reduced sheets are used, it is entirely satisfactory to start operations with No. 120 grit, thereby automatically slashing polishing costs. As an aid in determining when to change to a finer grit, it is advisable to alternate the direction of grinding with each new grit.

Most of these sheets can be given a bright polish in three to seven passes across a soft muslin wheel. If any small imperfections remain, it is advantageous to use fine abrasives. In many cases a No. 240 or a No. 320 grit will prove the most desirable.

Particular care must be exercised in the polishing of welded articles. To insure maximum resistance to corrosion, it is necessary to eliminate the weld scale entirely. This can be accomplished most easily by using a stiff fiber hand brush, a rotating brush or grinding wheel. Frequently it may be necessary to grind the weld flush with adjoining surfaces. If, because of warping, low areas occur along the weld, they should be bumped with a weld hammer along the under side. This avoids the danger of excessive grinding with subsequent thinning of the section.

For grinding the welds, some operators prefer a No. 30 grit while others choose a No. 80 grit. It is recommended that a weld length of about eight to twelve inches be completed at a time. It is well to remember that the smoother the ground finish, the more resistant the surface will be to corrosive attack.

When the grinding work has been completed, the ground areas should be thoroughly washed with a warm ten to twenty per cent nitric acid solution to remove foreign material which is likely to cause corrosion. This should be followed by a warm water rinse to prevent spotting by drying of the acid.

Clean Welds With Fiber

The final polishing operation should be performed in the same direction that the sheets originally were polished. In polishing stainless steels, grinding wheels which have previously been in contact with carbon steel grades or other metals should not be used. Operators are cautioned to use a fiber brush—never a wire brush in cleaning welds free from scale. Special grits for use on stainless steel also should be used for the grinding wheels.

Buffing compounds containing iron oxide should be avoided lest the surface be contaminated with particles of iron. To obtain the most satisfactory color, successful operators use commercial compounds based on aluminum oxide and follow with a color buff of green chrome oxide rouge.

What actually makes stainless steel stainless is the fact that the chromium in the metal inherently protects itself with a film of oxide which is invisible to the naked eye. As long as that film is preserved, every portion of the stainless steel will remain bright and shining. If it is broken down so that it cannot restore itself, corrosion will start.

One of the most frequent ways in which that film is broken down is through the process of soldering, because in soldering hydrochloric acid is used. Both hydrochloric and sulphuric acids attack stainless steel. Therefore, when hydrochloric or sulphuric acids are employed, every precaution should be taken to re-

Fine-grain buffing wheel is used to give final high grade luster

Non-portable arrangement simplifies polishing of flats

move the excess acid by rinsing the area carefully with water or neutralizing with a solution made alkaline with common washing soda.

This leads to another precaution called the "passivation" of stainless steel, brought about by dipping it for at least twenty minutes in warm nitric acid about twenty per cent strength after fabrication. Passivation means that the metal is treated to make the surface "passive" or inert, so it will not rust. The nitric acid cleans off any minute particles of iron or first that have been imbedded in the metal during fabrication or erection of the equipment.

Finishing processes require both adequate polishing equipment and experienced operators. Fabricators of stainless steel are finding that in large quantity applications they can pay for the polishing equipment in the first year or two with the money they save by doing their own finishing and polishing.

The new trend in the preparation of stainless for the finished product is giving this steel an opportunity to enter all kinds of new markets. Fabricators are becoming experts at roughing, dryfining, greasing and finishing of stainless. Whereas stainless was used only as a trim for de luxe products several years ago, many products are now made entirely of this metal. It is going into such widely diversified products as airplanes, soda fountains, canning and food handling equipment, furnaces, lunch counters, store fronts, oil burners, household refrigerators, kitchen sinks, dairy equipment, textile dye vats, tableware and kitchen cooking ware.

Every day sees the introduction of new uses for stainless steel. Next year's requirements promise to far surpass the record production of 52,000 tons in 1936.

Corrosion in Stainless Steels

SIMPLEST type of corrosion in stainless steels is that due to chemical attack, generally referred to as "solubility." Data on the penetration rate of various chemicals and solutions on chromium and chromium-nickel alloys are available.

Pitting, which is another type of corrosion, may be due to many causes. Among them is the formation of pits under foreign deposited material in the presence of electrolyte. The electrolyte may be an organic compound such as tar or rubber, or even a piece of glass. A deposit from the products of corrosion of the other metals, iron rust or copper oxide will also cause pitting. The formation of pits in the above mentioned cases is avoidable. Installation of stainless steels, even if used in dilute solution, should be faced away from any surface defects, (splashes from welding, traces of flux and particles of tar). In certain installations it is possible to keep the acidity of solutions down by the addition of alkali and thus minimize or entirely prevent pin-hole corrosion.

There is also the possibility of corrosion due to cooling gases. Condensation of some gases will form acids which will attack the metal.

Stress corrosion may take place in very mild corrosive media which in the absence of internal stresses would not attack the metal at all. This type of corrosion is induced by internal stresses which may, for example, be set up by welding.

Abstracted from paper presented by V. N. Krivobok at New York meeting of Iron & Steel Institute, May 27, 1937.

Why Dynamic Testing?

DR. RUDOLF K. BERNHARD
Consulting Engineer, Baldwin-Southwark Corporation

The skipper said to the engineer, the parts of the new ship have not learned to work together yet. . . .

Every inch of her has to be livened up and made to work with its neighbor. . . . Our new little ship has to be sweetened yet and nothing but a gale will do. . . . All the hundreds of little plates that are riveted to the frames echoed the call, for each plate wanted to shift and creep a little, and each plate, according to its position, complained against the rivets. . . .

And later, after the "gale," there was just as much groaning and straining as ever but it was not so loud or squeaky in tone, and when the ship quivered, she did not jar stiffly, like a poker hit on the floor, but gave with a supple little waggle, like a perfectly balanced golfclub. . . .

For when a ship finds herself, all the talking of the separate pieces ceases and melts into one voice, which is the soul of the ship.

—RUDYARD KIPLING

IN THIS ABSTRACT of one of Rudyard Kipling's famous short stories some of the most essential reasons for "dynamic testing" have been indicated, not only in a very poetic but also in an extremely obvious way.

Why do we make tests of any kind? We want to know more about the secrets of nature. Hence we must investigate the conditions which actually prevail and try to imitate them as closely as possible. Consequently, the loads which our engineering structures, machines, buildings, vehicles, bridges, etc., have to endure must be simulated in some way or other. If we consider the factor "time", then no engineering structure has to withstand constant (static) loads alone. Even a building, though it has to carry in the first place its own dead weight—which might be considered static—has also to withstand the live load of the moving inhabitants, alternating wind loads, etc. All these loads vary with "time" and represent, in other words, a special type of dynamic load. On the other hand our engineering structures hardly ever carry dynamic loads alone. The force of gravity is always acting and producing static loads. Hence it is very often wrong to apply either dynamic or static loads alone when trying to imitate natural field conditions. Only the right combination of both types of loadings will meet the actual requirements. In certain cases, when the effects of both types of loadings have to be studied separately either static or dynamic loads may be applied by themselves. It must be kept in mind, however, that both types of loading will influence each other in such a manner that they hardly ever can be added directly. Their effects superimpose upon each other, usually in a very complex way.

Dynamic tests have been used for centuries. Striking a piece of earthenware and listening for the resulting tone to die out is the most ancient form of impact investigation, and is well known to any housewife. The doctor knocks against the human

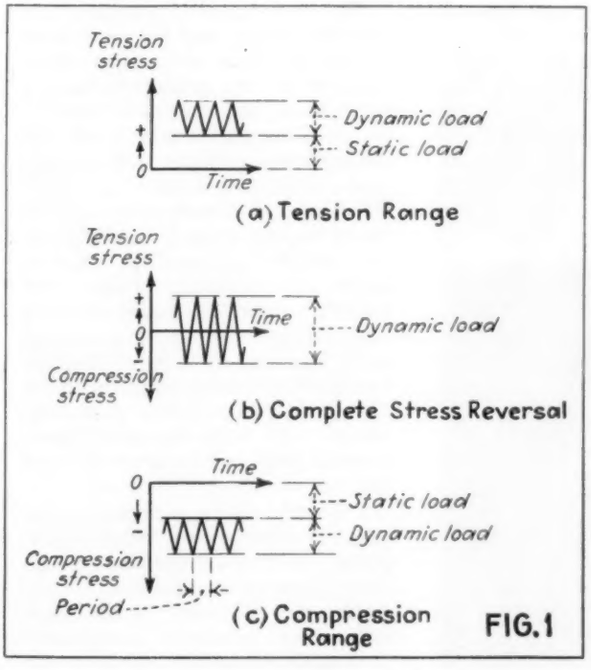


FIG. 1

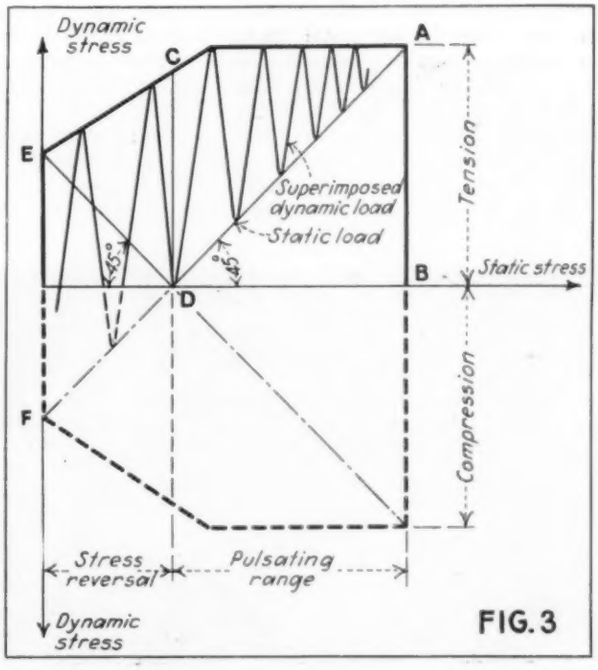
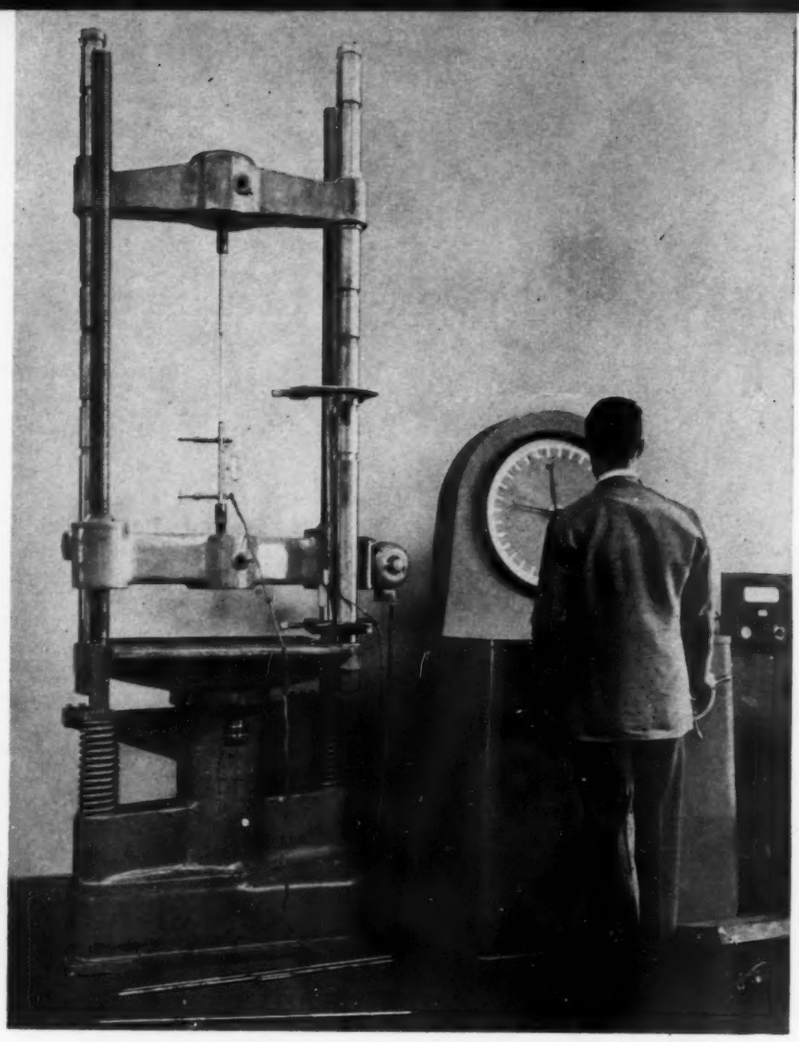


FIG. 3

body and listens to the timbre of the resulting sound. He makes his diagnosis according to this strictly dynamic test. Both housewife and doctor—each in their own field—would never use static loads alone by simply applying a constant pressure.

In the practical field of the engineer static tensile, compression, shear or bending tests have been supplemented more and more in recent years by the corresponding dynamic tests. Fatigue and endurance limit, hysterises, damping capacity, creep, aging, and the so-called "form-factor" are only some of the dynamic equivalents, which have to be investigated. A classification of dynamic and static tests might be made by considering various combinations of static and dynamic loads. Fig. 1 a-c represents these three types of stress combinations: tension range where the static load is tension and the superimposed dynamic load causes a shift of the zero line to the tension side (Fig. 1a); complete stress reversal where only dynamic loads are considered, tension and compression have the same value (Fig. 1b); and compression range where the static load is compression and the superimposed dynamic load causes a shift of the zero line to the compression side (Fig. 1c).

A striking example where all three types may occur is a simple steel bridge. A time-stress diagram in the lower chord (a-b) of a truss, while a steam locomotive is passing the structure at its critical speed, is shown in Fig. 2b. Point *B* indicates the time when the locomotive first touches the bridge with its front wheels, point *C* the time when the last wheel leaves the bridge. Line I represents the zero stress, line II the static load caused by the dead weight of the bridge and line III the superimposed static load induced by the weight of the locomotive. Line IV finally shows the superimposed dynamic load (vibration) excited by the unbalanced masses of the locomotive drivers, which cause the so-called "impact". From *A* to *B* we have only static loads, from *B* to *C* the static load has superimposed dynamic stresses which resemble Type 1a (tension range), from *C* to *D* the dying out effect prevails (in a frequency of the natural period of the bridge) which is approximately Type 1b (complete stress reversal). Here the assumption is made that the influence of the dead weight of the bridge can be neglected. Type 1c (compression range) would be indicated in the time-stress diagram of the upper chord c-d (see Fig 2a) of the same truss.



Steel bars are loaded in tension in Baldwin-Southwark 60,000 lb. static test machine with Tate-Emery load indicator

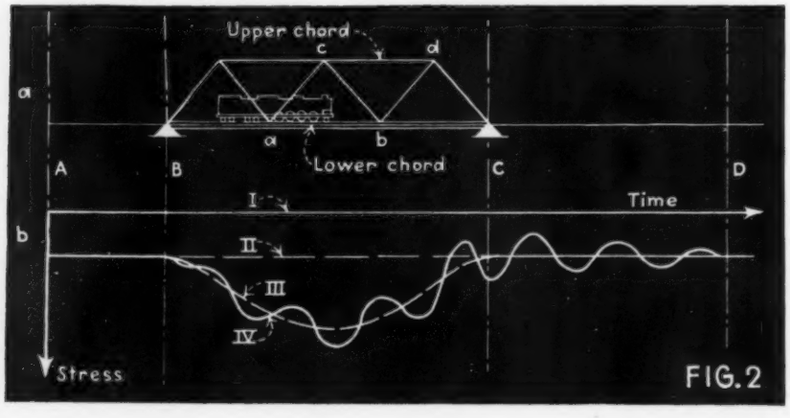
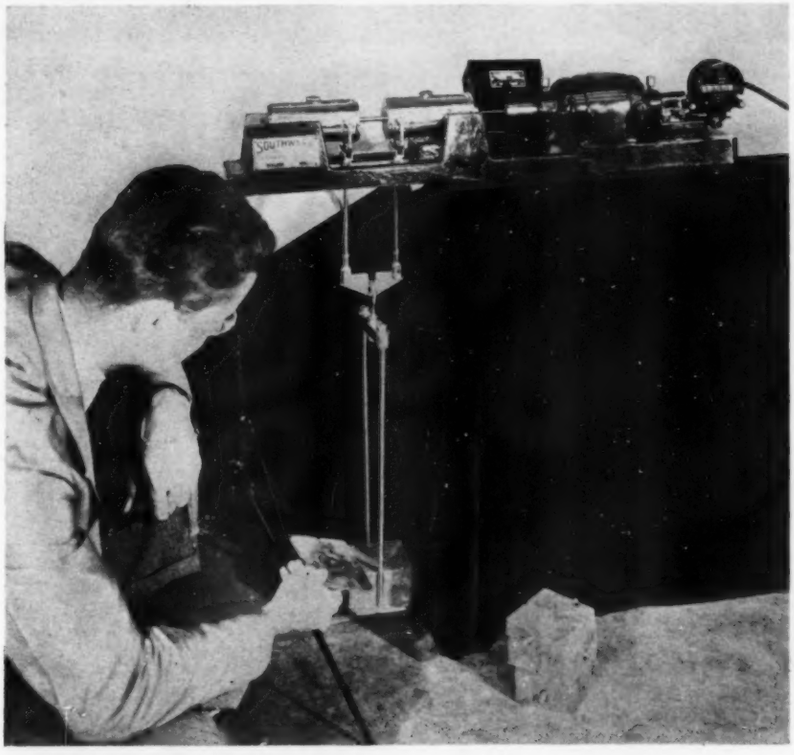


FIG.2

The final result of all static and dynamic testing may be represented in Fig. 3. The two straight lines drawn at 45 deg. indicate the various static loads, the curved lines show the superimposed dynamic loads (including varying ranges and frequencies). The thick border line represents the maximum unit stresses which may be allowed for the material or the engineering structure under investigation. Hence *AB* (= DB) shows the maximum static stress without any superimposed dynamic load, line *CD* a purely dynamic load from zero to a maximum in the tension range and *EF* a purely dynamic load with complete stress reversal (the above mentioned Type 1b, Fig. 1).

It has to be kept in mind that the so-called "form-factor" plays an important role in all dynamic testing. This "form-factor" includes, for example, the dangerous notch effect, the surface sensitivity (corrosion), the internal damping capacity of the



High speed rotating beam machine (R. R. Moore) reverses stresses in machined specimen at rate of 20 to 170 cycles per second

material itself, the external damping of the riveted or welded connections and to a certain extent even the fatigue and creep effect.

The ever increasing use of welded structures is another reason for the use of further dynamic investigations. Tests on welds can be made accurately only with actual connections. Here the dynamic effect of the "form-factor" has led to change in the structural shape of welded connections.

Small specimens are in many cases not sufficient on account of the predominant influence of their surface or internal conditions (flaws, slag inclusions, etc.). They can be used, however, to get comparative values but seldom for absolute figures. Only the testing of parts of the structure or in some cases even of the structure itself, either in the form of a model or in the field, will give the final information for all these special types of dynamic effects.

The abstract of Rudyard Kipling's short story describes a striking example of the dynamic effect on an actual ship structure. This ship has been tested dynamically in a very natural way by a strong "gale." The result was the final adjustment of all the riveted connections,—in other words, the replacement in a certain way, of an annealing or aging process.

In this short article it is impossible to describe or even to mention all the types of dynamic problems which could be considered. The bibliography at the end may be of some help for further study.

Those testing machines which are able to simulate all the above mentioned static and dynamic combinations of stresses—including also the possibility of making separate static or dynamic investigations—are therefore desireable. The inertia effect of the testing machine itself plays an important part, and this especially, in all dynamic investigations, has to be overcome. Only a very few testing machines, the so-called "oscillators" and "pulsators," are able to handle all three combinations, especially on models or actual structures.

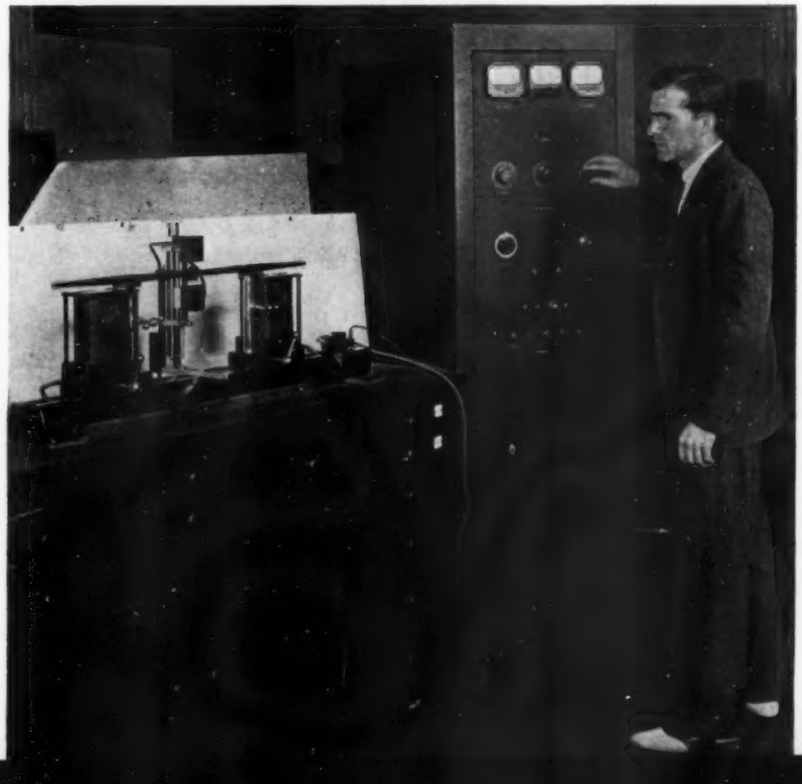
Oscillators consist of two eccentrically supported discs, rotating in opposite directions. Hence sinusoidal forces can be excited with a frequency depending on the rotating speed of the two masses and a force depending on the eccentricity of the two masses.

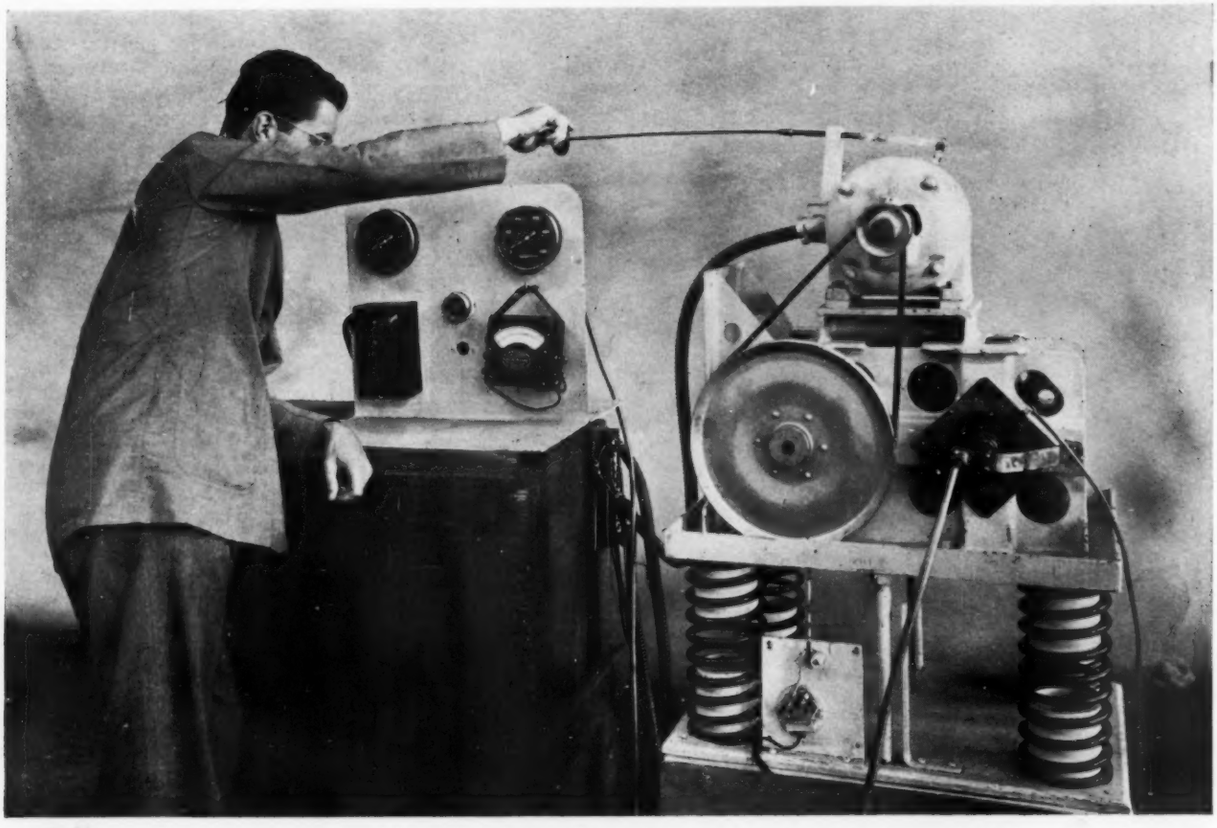
Live Loads

Pulsators can be considered as a supplement to any static hydraulic testing machine. A special pump, the pulsator, superimposes the required pulsations in the loading system of the machine.

In case an "oscillator" is used the structure or part of the structure stays in its original condition and the oscillator is fixed on the structure, in case a "pulsator" is used the specimen has to be brought to the pulsator. On the other hand quite a number of very simple machines cover the complete stress reversal (Type 1b): the so-called rotating or vibrating beam machines, rotating cantilever or impact machines. All of these use small spe-

A. V. DeForest high frequency fatigue machine (100-300 cycles per second) tests specimens without machining. May be used to determine effect of actual surfaces on fatigue strength of material





Dynamic oscillator determines characteristics of four springs, is suitable for producing dynamic forces up to 1,000 lb. at frequencies of one to forty cycles per second

cimens which have to be inserted in the machine.

The R. R. Moore high speed fatigue machine with a range of 20 to 170 cycles per second requires a machined specimen of standard size, which is loaded by weights and rotated about its longitudinal axis. Hence the specimen receives a complete stress reversal each revolution.

The A. V. DeForest fatigue machine having a range of 100 to 300 cycles per second uses a specimen which does not have to be machined. Specimen is vibrated as a simple beam—supported at the two nodes or points of no motion—in its natural frequency. The load is applied at the end of the specimen by electromagnets, excited by alternating current. The outstanding feature is the high range of frequency, up to 300 cycles per sec.

Most machines now in use are simple static machines. The well known static machines load the specimen either by lever and poise or by a hydraulic system. They have been built up to capacities of 10,000,000 lb.

The scope of this article is such that a description of all these different types of testing machines cannot be included.

Our testing methods already tend to acknowledge the importance of dynamic investigations. The constantly increasing speed and the heavier loads on our vehicles, high grade materials (steels, alloys, aluminum, etc.) and welded structures are forcing the engineer to become more and more "dynamically minded." It is certain that static tests will be supplemented by dynamic tests without exaggerating one side nor sacrificing the other. Future development of our testing machine will be guided by these fundamental conceptions.

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INDUSTRIAL REVIEW

MACHINERY buying has felt the effect of war scares, stock market declines and presidential pronouncements. Of the three, the New Deal prospects seem to have played the greatest havoc with jittery nerves in industrial centers. Both the state of business and future outlook are widely divergent in different localities. While most communities have experienced a recession (not depression) some see improvement soon ahead; others find orders drying up with few more in sight. Reports are often colored by the immediate experience of the observer. A bad week makes his outlook gloomy; a few good orders make him optimistic. Looking at the machine tool situation dispassionately, the condition is not bad at all. Most shops are booked to January 1 at least, and although current shipments exceed orders, the opportunity to improve quoted deliveries will be helpful. Increased foreign buying has taken in some of the slack caused by the hesitancy of domestic buyers; and, even locally, many concerns are refusing to modify long range modernization programs to meet immediate influences.

SOME sizable orders have been placed in the New York district recently. In the shadow of Wall Street gloom, industries that have been considered hard hit are continuing their buying. Requests for quotations are coming in briskly. Philadelphia finds that September sales equalled the August volume with good prospects for improvement in October. In Pittsburgh, too, machinery activity continues on an even keel though somewhat lower than last spring. Inquiries have tapered off some during the past two weeks.

CINCINNATI notices a recession in domestic sales, but for some manufacturers this was more than replaced by foreign business. Several shops had very good months in August and September with prospects of more export orders in the offing. The level of production is keeping up in Cleveland but this condition is due partly to the working off of backlogs. New orders have fallen off somewhat although September showed a good gain over August. Railroads have reduced their buying, and automobile production is at a lower level. One of the large tractor plants is closed for a month. There are signs of resistance to increased retail prices. Toledo reports considerable potential machinery business and some orders in the face of a feeling of a doubt.

DETROIT looks to improvement in equipment sales and an increase in general business. There is a strong feeling here that despite all comment to the contrary 1938 will be good motor year. Car builders will at least need equipment for replacement and with the changes in models there will be added purchases of small tools. A number of large programs are being considered in Chicago which if approved by managements will bolster machinery buying. Large corporations have not checked rehabilitation programs already initiated but are not starting any new ones. The buying from small intermediate customers have about dried up. In Milwaukee orders have receded every month since July with September some 22 per cent under the August level. The immediate outlook is for further reduction as inquiries have fallen off perceptibly. The expected fall upturn has not materialized in St. Louis. September was a poor month for machine tool business, and this city is quieter than at any time this year. Inquiry is tentative, and there is little in sight that promises to close quickly. On the Pacific Coast the A.F.L.-C.I.O. settlement in San Francisco gives promise that the port will be kept open. Mining companies are spending large sums in expansion programs and modernizing equipment. The new army air base at Sacramento is under way. Machine tool orders remain fairly good but below six and twelve months ago.

CHIPS

Washington

Roosevelt visits Seattle and intermediate points as Justice Black arrives at Baltimore, Washington wonders when they will meet . . . John Biggers gets go-ahead on unemployment survey, decides to do it by mail to avoid building up another bureaucracy, starts November 17 . . . Sec. Perkins is not invited to address A.F. of L. at Denver convention . . . Roosevelt promises that he will press further New Deal measures. . . . Sec. Farley, out of favor, will retire to private life . . . U.S. Chamber of Commerce presents figures to prove surplus tax is hurting trade and hindering employment . . . Under President's instructions Treasury works on expense curtailment, excepting salaries and relief . . . Roosevelt defends planning and little T.V.A.'s in Oregon speech . . . Black admits past, denies present Klan membership.

Finance

Stocks tumble again to new lows . . . W. O. Douglas succeeds Landis as S.E.C. head . . . Federal tax income up more than a billion from 1936 level . . . Reserve Board relaxes restrictions on eligible list for commercial paper, insists move has no connection with market decline.

Foreign

Japan warns foreign diplomats to leave Chinese capital before it is destroyed by air attack, British and American officials protest . . . Japanese planes bomb residential sections of many cities killing thousands of civilians . . . Hitler and Mussolini move to conciliate Great Britain, France to be approached later . . . Fuehrer puts on great show for Duce in Berlin . . . Ethiopians massacre Italian garrison and civilians at Makale . . . Russian note to Japan warns that she will be held responsible for any damage to Soviet embassy in Nanking, workers pass resolutions condemning air attacks on civilians . . . 23 nations at Geneva solemnly indict Japan for murder of civilians . . . Japanese boycott spreads in England . . . Soviet ambassador to China departs suddenly by air raising rumors of Russian intervention . . . Britain and France threaten to open Spanish frontier to aid of Loyalists if Italian troops are not withdrawn.

Industry

Ford Brotherhood, independent employee body, makes 14 demands on company, gets permission of NLRB to file briefs in board's action against Ford . . . American Legion votes to remain neutral in labor conflicts, puts no ban on members acting as they please out of uniform . . . Reduced railroad income leads to large reductions in number of employees . . . A.F. of L. Metal Trades Department takes lead in demanding expulsion of C.I.O. at Denver . . . A.F. of L. men force way through C.I.O. pickets into Port Huron plant of Mueller Brass to resume work.

Indicators

Steel production drops several points to around 75 . . . Electric power output steady . . . Metal Trades employment dropped 0.2 per cent in August . . . Business Week's index drops a point to 75.

A.G.M.A. Meeting Held at Lake Wawasee

LAKE WAWASEE, IND.—Displaying his usual flair for selecting attractive locations for the meetings of the American Gear Manufacturers Association, Manager-Secretary J. C. McQuiston picked the Spink-Wawasee Hotel for the Association's twentieth semi-annual gathering. An innovation of the meeting was that it covered three days, September 20, 21 and 22, instead of the usual two, which gave opportunity for committee members to meet without missing any of the technical and business sessions.

On Monday evening members and guests were addressed by Eric Oberg, editor of *Machinery*, and John Haydock, managing editor of *American Machinist*, on foreign industrial conditions. Mr. Oberg spoke of the social and economic conditions existing in Sweden where he spent several weeks this summer. Mr. Haydock described his visit to the Leipzig Trade Fair and his impressions of the 22 industrial plants visited while in Europe.

Other guest speakers were A. S. Crockett, General Electric Co., who spoke on the valuation of jobs based on community rates; Paul Fielden, president, National Association of Credit Men, whose subject was the credit situation; R. F. Smethurst, assistant counsel, National Association of Manufacturers, who gave an address on present and pending legislation; Dr. Stewart Way, Westinghouse Electric & Manufacturing Co., Research Laboratories, who discussed roller tests to determine pitting fatigue strength, and Dr. N. E. Woldmann, Eclipse Aviation Corp., who spoke on the micro-structure and machinability of gear steels.

In addition, papers were presented by three members of the association. A supplement to his previous contribution on "Factors Influencing the Durability of Automobile Transmission Gears" was given by J. O. Almen, Research Laboratories Division, General Motors Corp. This paper described the method of determining tooth stresses. In his address, "Electric Motors for Gearmotor Applications", L. R. Botsai, Westinghouse-Nuttall Works, classified the various types of motors used for speed reducer work and gave the characteristics of each. The method of heat-treating large gears by means of the oxy-acetylene flame was discussed by W. E. Sykes, Farrell-Birmingham Co., in his address on "Torch Hardening Method for Gears."

T. R. Rideout, Westinghouse-Nuttall Works and chairman of the A.G.M.A. Standards Committee, gave a talk on "Our Relations with Other Organizations." Mr. Rideout spoke particularly of the cooperation between the gear manufacturers and other groups in the formulation of standards.

The association bestowed an honorary life membership on F. L. Nicholson, who recently retired from the Westinghouse Electric & Manufacturing Co. The association's President, H. H. Kerr, Boston Gear Works, was chairman at the informal dinner held Tuesday night. Members and guests were entertained by a showing of colored moving pictures by L. D. Martin, of the Eastman Kodak Co.

E. W. Miller, Fellows Gear Shaper Co. and F. W. England, Illinois Tool Works, enjoy a little sunshine between sessions

The A.G.M.A. Executive Committee came out in the open after a busy meeting. Seated, left to right:: Howard Dingle, Cleveland Worm & Gear Co.; H. H. Kerr, Boston Gear Works. Standing J. C. MsQuiston, A.G.M.A. Manager-Secretary; U. Seth Eberhardt, Newark Gear Cutting Machine Co.; Charles F. Goedke, Ganshow Gear Co.; L. R. Botsai, Westinghouse-Nuttall; W. G. Jones, W. A. Jones Foundry & Machine Co.; John H. Flagg, Watson-Flagg Machine Co.; B. F. Waterman, Brown & Sharpe Mfg. Co.; E. S. Sawtelle, Tool Steel Gear & Pinion Co.; Frank B. Drake, Johnson Gear & Mfg. Co.; and George L. Markland, Jr., Philadelphia Gear Works.

DETROIT LETTER

U.A.W. not to strike until after Detroit elections . . . Car sales outlook not promising

DETROIT—This ought to be the season of good cheer in automotive circles, with the annual shows close at hand and new car introductions acting as a stimulant to car sales. However, the industry's executives are seriously worried about two problems —whether they are to have production this quarter stopped by strikes and whether public buying will be so good as the factories estimate in their recent pulbicity releases.

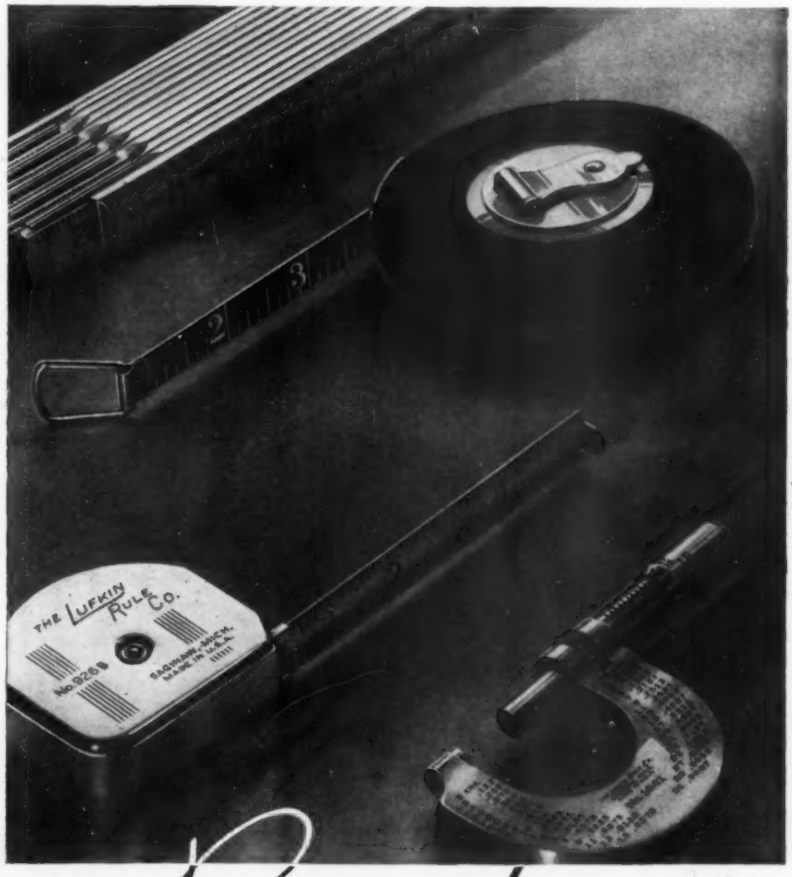
The United Automobile Workers are showing signs of wanting to "go off the ranch." A controversy now on between Plymouth and the U.A. W. local may wind up in a strike at any time. Among other charges, the union asserts that the company has speeded up operations unduly since 1938 production started. It also opposes introduction of new equipment which cuts down manpower. Strikes have been threatened at Ternstedt and General Motors Truck. Meanwhile union negotiations for a revised contract with General Motors go on; indications are that they will drag on for several weeks.

C.I.O. Money in Detroit

John Lewis, so the story goes, has given explicit orders to President Homer Martin of the U.A.W. that any strikes shall be held off until after the November municipal election in Detroit. The U.A.W. has its own candidates for mayor and city council and doesn't want anything to happen which may adversely affect public opinion as expressed in the ballot box. Mr. Lewis has high hopes of capturing Detroit's city government, particularly its police department which was so rash last spring as to attempt to oust some of his sitdowners from illegal possession of factories. Accordingly he is reputed to have poured considerable C.I.O. money and men, including a publicity director, into this city to try to put a labor government into office.

The trouble for Mr. Lewis is that he did not count on the organized opposition of the Detroit Federation of Labor, A. F. of L. affiliate, which has its own ideas of what a labor government should be. It is backing a totally different slate of candidates. The prevailing opinion is that the U.A.W. is likely to take a licking which will give it a setback in prestige. It appears that the U.A.W. candidate for mayor will be one of the two top men nominated at the primaries, but he will be beaten at the "run-off" election next month.

After the election is out of the way, the union is apt to kick up a big fuss. Ford, of course, is one of the places where trouble is looked for. One must remember that any union thrives on stirring up strikes or incipient strikes and right now it is getting increasingly hard for the union to keep in public print



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and to secure payment of dues as the period of peace lengthens.

On top of labor worries are piled uncertainties regarding the sales outlook. Top executives are not kidding themselves that selling cars is going to be easy the coming year. Business recovery isn't so spry as it was, the stock market has been acting up in a most unseemly manner and car prices have been jacked up more than the industry will admit publicly. Individual companies are busy pointing out the smallness of price advances, but they are comparing the new prices with those of September and not with those of July. Altogether, these factors are not so bullish and one of the big companies thinks that in the fourth quarter it will not be able to sell as many cars as in the same quarter a year ago.

Nobody in the industry, except General Motors, is talking in terms of 1938 being as good as 1937. Speaking from its own standpoint, General Motors has a sound basis for believing that next year will equal this year. It could have sold at least 250,000 more cars this year if its production had not been stopped for six weeks by the big strike. If it is fortunate enough to run through the coming year without a major strike, it no doubt will make and sell as many cars as this year or perhaps more. Its sales quotas for the model year 1938 are: Chevrolet 1,200,000 units, Buick 260,000, Pontiac 300,000, Oldsmobile 250,000, and Cadillac-LaSalle 50,000. All of which adds up to 2,060,000 cars for the corporation. It is a good guess that production in 1938 for the industry may be off 500,000 units from the 1937 figure of 5,100,000.

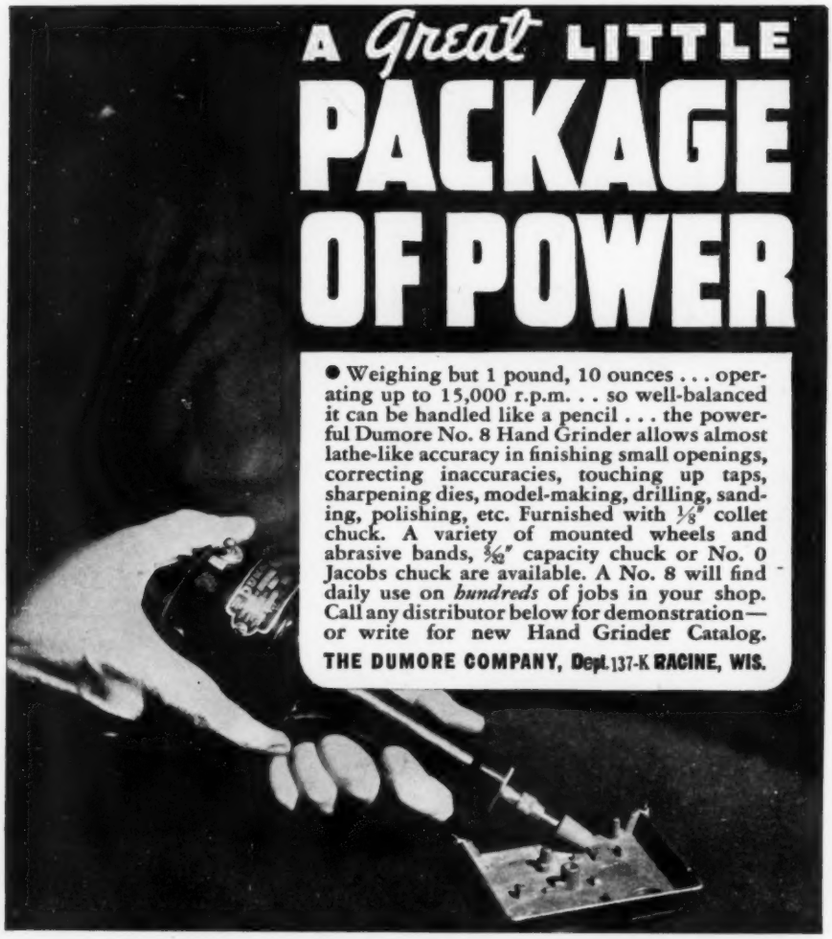
Packard is ballyhooing a new method of rear springing which it claims gives the same effect as independently suspended rear wheels. Leaf springs are mounted in rubber and leaves are separated with rubber and oil impregnated bronze discs. New transverse stabilizers and improved shock absorbers form an important part of the springing. Bodies are now equipped with one-piece steel tops.

Aluminum Bantam

The job of improving the American Bantam engine, according to reliable reports, was turned over to the research and engineering departments of Bohn Aluminum in Detroit. The result was a redesigned combustion chamber, autothermic aluminum pistons, aluminum crankcase and an aluminum head which has increased engine power 40 per cent. American Bantam is going ahead on a conservative basis and expects to make a strong bid for business in the light delivery field.

Aside from the new Graham and Lincoln-Zephyr, it is probable that the most talked about car of the year will be the redesigned Cadillac 60. It has no running boards and a double-drop frame and the front-end appearance bears a slight resemblance to the Cord. Incidentally, the Cord has pioneered a style the influence of which is being felt widely throughout the industry. Cadillac 60's will not be available in dealers' showrooms until January or February due to production delays.

Observers are agreed that next year should be one of the best years in history for equipment buying in the automotive industry. Newly-designed engines and other parts for '39, plus the urgent necessity for cutting production costs, will bring a wave of machine tool purchases which should be welcome to equipment builders.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WATCHING WASHINGTON

Black Admits Former Klan Connection . . . Fights Loom On President's Policies Despite Ovations In the West

WASHINGTON—Considering the spot he was in Justice Black made the best of a bad situation in his radio broadcast last Friday night. He admitted frankly enough joining the Ku Klux Klan but failed to explain the reasons for many of his actions. In Justice Black's mind the incident may be closed, but as bearing on new deal policies and objectives, it is likely to have a marked influence for some time to come.

While Justice Black was on the air in New York, the President was far away in the Pacific Northwest apparently looking in the other direction. Any communication between him and Mr. Black prior to the radio address was vigorously denied in official circles.

On Monday, former assistant attorney general Albert Levitt asked the Court's permission to file a suit seeking to force the new justice to show cause why he should not be declared ineligible for the Supreme bench.

Finds Folks With Him

The purpose of the western trip was obviously political. The President wished to sound out the results of his policies and to restore his waning prestige. It is believed that he will return to Washington more determined than ever to push his own programs and to have his own way about legislation involving social and economic reform. He has found out that the great majority of the folks back home are with him, or at least he has received evidence satisfactory to him of this for it is almost impossible for a president to find out anything else. But the men who opposed him on court packing, on wages and hours, on tax ideas and who are going to fight him again next session knew this before they started to fight.

According to some observers Roosevelt will be mildly injured by his present trip. Not because he will lose any strength but because he will come back so cocksure that he will be more daring and more ruthless and hence fall all the harder when the time comes which many feel sure will be the result in some of the fights to come.

Without specifically mentioning the President's court-packing proposal, Chief Justice Hughes and his colleagues in a report setting forth the conclusions of a three-day judicial conference denied that there was any need for a large number of additional judges. They pointed out that in 75 of the 87 judicial districts no additional judges were needed and that the Circuit Court of Appeals is well up in its work. As against the President's proposal for 50 new judges the report renewed recommendations for the appointment of twelve additional district judges and four Circuit Court of Appeal judges. Although the recommendation was made last year, it has not as yet been acted upon, indicating that if any congestion exists the fault

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should not lie with the judges or the courts.

Middle Class May Pay

Much of the effect of the President's latest promise to balance the budget has been lost through repetition. Business men realize that little has been done to curtail expenses in government and that, if increased taxes are required, any proposal to impose a levy on the low income brackets will be political poison especially in a Congressional election year. A national sales tax would be equally unpopular. There is a possibility that heavier levies may have to be borne by the moderate income groups by stepping up lower brackets of the income tax more steeply. In short, the great middle class faces the prospect of paying for skyrocketing government expenditures and bounties to the improvident man, who is no longer forgotten, not only in rapidly rising costs of living but as additional assessments on their income. This prospect is, of course, assuming that a serious attempt at budget balancing will be made. What is even more possible is that political expediency will sidetrack the issue for another year by diverting some of the Social Security income, now mounting at the rate of $16,000,000 monthly, and avoid embarrassment for Congressmen who will be running for re-election in 1938.

Prospects for a trade agreement between the United States and the United Kingdom have been improved considerably by the situation in the Far East. Great Britain has seized in the Oriental turmoil an opportunity to regain some of the markets lost to Japan particularly in the field of textiles. If Japan is successful in increasing her territorial holdings in China she will have a fertile field for the production of cotton. There is a community of interest here between the American cotton grower and the British textile mill owner. Because of the volume of trade between the two countries, involving some 80,000 individual items, negotiations will take some time.

Profits and Promises

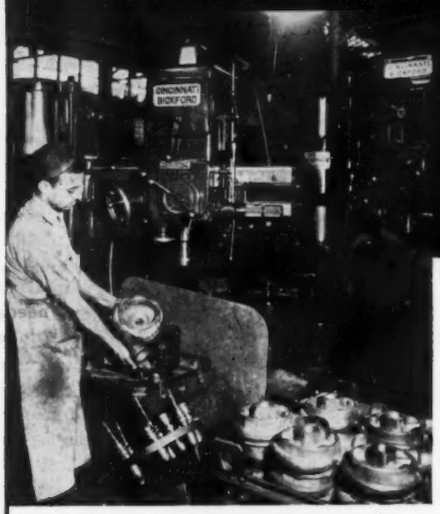
President Roosevelt's recent promises about balancing the budget in 1937 are not important intrinsically, but may be important to business because of the motives actuating the statement. The point is that nothing on the horizon points to any ability on the Administration's part actually to balance the budget in 1939 save by terrific boosts in taxes.

The Treasury is deeply concerned about the prospect, particularly since it knows the income tax returns of March 15 next will fall far short of those made last March 15. For example there will be few stock and bond profits such as swelled the last returns. Quite the contrary.

The reason the President made this budget promise was concern over the condition of business, primarily concern over the timidity of investors. So it might be logically deduced that the President would be swayed by political expediency to withhold further doses of business regulation until the patient gets stronger.

Proof that the President was thinking in terms of reassurance, rather than in actual curtailing of spending, can be had by just reading over his Western speeches. Promises of continued spending on projects were lavish, talk of economy very general indeed.—Carter Field, *Washington Bureau, McGraw-Hill Publishing Co.*

CINCINNATI BICKFORD



SAVES 30% for WORTHINGTON

● In the drilling and tapping of these centrifugal pump cases, the new High-Speed Super-Service Radial saves approximately 30% in direct labor as compared with previous methods. The Worthington Pump & Machinery Corporation could reasonably predict this saving for this is their 14th Super-Service Radial at the Harrison, New Jersey works.

One of their 6' Super-Service Radials is regularly drilling 1-1/64" holes in bronze condenser tube heads at the remarkable penetration rate of 42.9" per minute. This speed is all the more impressive when one considers the rigid manufacturing standards to which Worthington products are held.

The satisfying performance and savings accomplished by the Super-Service Radial in the country's leading plants result from its long lived accuracy and its distinctive convenient control. Every lever is always within easy reach at the operating position.

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SUPER-SERVICE RADIALS

International Acetylene Meeting Program Completed

Leaders in the welding industry are to appear on the program of the 38th Annual Convention of the International Acetylene Association, according to a recent announcement. The meeting this year is being held in Birmingham, November 10–12.

The program includes three technical sessions which are to be held in the afternoon, and Round Table discussion groups are scheduled for Wednesday and Thursday evening. Tentative program for the convention is as follows:

Wednesday, November 10
12:15 p.m.

Opening Address, by C. D. W. Gibson, president.
Presentation of the Morehead Medal.

2:30 p.m.

Technical Session: "Speeding Manufacture and Construction with Oxy-Acetylene Welding."
Lester N. Shannon, vice-president, Stockham Pipe & Fitting Co.; *Chairman.*
"Butt-Welding of Railroad Rails."
R. R. Cummins, Central Railway of Georgia.
"Piping Design, Fabrication and Erection." O. B. McLaughlin, Freeport Sulphur Co.
"Welding of Power Piping." Lee Hopkins, John W. Danforth Co.
"Metallurgical Problems in Bronze-Welding—Cast Iron Pipe." Dr. J. T. MacKenzie, American Cast Iron Pipe Co.
"Welding of Cast Iron Pipe." C. L. Lane, Walworth Alabama Co.
"Welding in a Chemical Plant." E. A. O'Neal, Monsanto Chemical Co., of Alabama.

Thursday, November 11
12:15 p.m.

Annual Luncheon and Business Meeting.
Reports of Committees.
Election of Officers.

2:30 p.m.

Second Technical Session: "How and and Why to Use Oxy-Acetylene Cutting."
E. E. Michaels, general manager, Chicago Bridge and Iron Co.; *Chairman.*
"Oxy-Acetylene Cutting in Fabrication."
A. E. Gibson, president, Weliman Engineering Co.
"Management of Machine Cutting Operations." Dr. G. V. Slottman, Air Reduction Sales Co.
"Cutting and Tempering of Structural Steels." H. H. Moss, The Linde Air Products Co.
"Use of Shape-Cut Parts in Machine Design." Lukens Steel Co.
"Cutting Alloy and Clad Steels."
W. D. Keeler, Ingersoll Steel & Disc Division, Borg-Warner Corp.
"Oxy-Acetylene Cutting as Applied to Repair and Conversion of Present Cargo Vessels to Tankers, and to Marine Work."
A. C. Leigh, Ingalls Iron Works Co.

Friday, November 12
2:30 p.m.

Third Technical Session: "Maintenance and Operations Uses of the Oxy-Acetylene Process."
K. L. Landgrebe, vice-president Tennessee Coal, Iron & Railroad Co.; *Chairman.*
"Selective Hardening of Ferrous Materials with the Oxy-Acetylene Flame."
R. L. Rolf, Lakeside Steel Improvement Co.
"Flame-Hardening." John Howatt, American Spiral Spring Co.
"Important Uses of the Oxy-Acetylene Process in Steel Mill Operations." W. J. Sannemann, Tennessee Coal, Iron & Railroad Co.
"Reclamation of Textile Mill Parts."
Hugh Comer, Avondale Mills.
"Welding Stainless and Alloy Steels."
H. C. Whittmer, Republic Steel Corp.

The first Round Table discussion will be an engineering session and will consist of a series of concurrent meetings for open discussion on problems of economics, management and design relating to welding and cutting of special interest to managers, engineers, foremen and others planning and supervising welding and cutting operations. This session will be under the general chairmanship of J. I. Banash, consulting engineer, International Acetylene Association.

The second Round Table discussion is intended as an operating session of special interest to shop owners, welding and cutting operators, as well as to those planning and managing welding and cutting operations. It will be under the general chairmanship of W. S. Hayes, managing director, American Welding Society.

A tour of the Tennessee Coal, Iron & Railroad Co., United States Steel Corp. subsidiary, Ansley and Fairfield, Ala., is arranged for Friday morning, November 12.

Speed and accurate performance are essential to successful shearing. • Cincinnati All-Steel Shears cut at high speeds with machine tool accuracy. • • •
THE CINCINNATI SHAPER COMPANY, CINCINNATI, OHIO

Rustless Iron & Steel Opens New Plant

BALTIMORE—Nearly 200 men prominent in U. S. business and industrial life attended the formal opening of a $1,500,000 addition to the Rustless Iron & Steel Corp. plant in Baltimore. The addition provides for a 20,000-ton expansion of the company's annual ingot capacity. Of nation's reputed consumption of 100,000 tons, plant will have a capacity to provide 40,000 tons of stainless steel ingots and 12,000 tons of rerolling and forging billets and hot and cold finished bars and wire.

A luncheon was served the guests at the Hotel Belvedere, Baltimore. Speakers at the luncheon were: George M. Verity, chairman of the board of directors, American Rolling Mill Co.; Hon. Howard W. Jackson, mayor of Baltimore; General Henry M. Warfield, president, Baltimore Association of Commerce; Charles S. Payson, director, Marine Midland Trust Co.; and C. E. Tuttle, president, Rustless Iron & Steel Corp.

After luncheon the guests visited the plant and were shown the Rustless process of stainless steel manufacture. New additions to the plant include a three-high type 12 in. merchant bar mill housed in a 240 x 80 ft. building and equipped with a 10-ton, 80 ft. span overhead crane, billet heating furnaces, cooling pit, three 12-ton electric furnaces. A 323 x 60 ft. brick and steel building houses equipment for cold drawn and finishing Rustless steel bars in straight lengths.

The plant is exclusively engaged in the production of stainless steel and performs every step in the manufacture of stainless steel bars, rods and wires from the virgin chrome ore to the finished product.

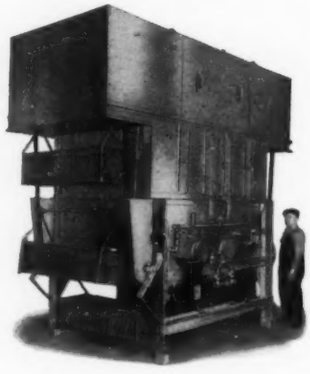
Three of the 12-ton electric furnaces have been added in Rustless Iron & Steel expansion

Better Metal Cleaning at Lower Costs ★ ★ ★

★ **Eliminate Rejects with Perfect Cleaning**

★ **Speed Up Your Production Cleaning**

★ **Eliminate Excessive Labor and Waste**



The Blakeslee Solvent Degreasing process renders the metal parts clean and dry in one operation. No scrubbing or soaking. Oils, greases, drawing compounds and polishing compounds thoroughly and quickly removed. All spot welds, cracks, and seams cleaned 100%.

There are small hand operated degreasers as well as the large fully and semi automatic models. No matter how large or how small your job there is a Blakeslee Dual-Vapor-Control degreaser to fit your cleaning requirements.

A 30 day free trial is offered you on any one of our standard model degreasers. The transportation charges and the solvent used during the test are the only obligations.

Literature mailed upon request

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J. Mossgrove is Elected Track Supply Group Head

At the election of officers for the Track Supply Association at the annual convention and exhibit in Chicago, September 14–16, J. Mossgrove, Austin-Western Road Machinery Co., was elected president, to succeed H. H. Talboys, Nordberg Mfg. Co. L. Adams, Oxweld Railroad Service Co., was named first vice-president and R. J. McComb, Woodings-Verona Tool Works, second vice-president. Louis Thomas, Q & C Co., was elected secretary-treasurer. Directors elected were Ross M. Blackburn, Buda Co., Howard C. Mull, Warren Tool Corp., and H. M. McFarlane, O. S. Jordan Co.

Porcelain Enamel Institute Completes Forum Program

Beginning with the seventh annual meeting of the Porcelain Enamel Institute in Chicago on Oct. 11–12, and finishing with the second Institute forum at Ohio State University, Columbus, Ohio, on Oct. 13–15, a complete and interesting program has been arranged. Among the speakers who will appear on the annual meeting program are R. G. Calton, Tennessee Enamel Mfg. Co., Institute president; E. L. Lasier, Titanium Alloy Mfg. Co., a vice-president of the Institute; F. E. Hodek, Jr., General Porcelain Enameling & Mfg. Co., Institute vice-president; and William Hogenson, Chicago Vitreous Enamel Product Co. In addition the following section chairmen will present their plans for 1938: H. D. Chase, Chicago Vitreous Enamel Product Co.; Earle S. Smith, Toledo Porcelain Enamel Products Co.; George S. Blome, Baltimore Enamel & Novelty Co.; Herman L. Cook, Norge Corp.; R. H. Turk, Porcelain Enamel & Mfg. Co. Elections of executive committee members and officers will be held at the morning session on Oct. 12.

Registration of those attending the forum in Columbus will be held the morning of Oct. 13, and the regular program will start in the afternoon. The revised program for the forum is as follows:

Wednesday, Oct. 13

10:00 a.m.

"Summary of Porcelain Enamel Institute Activities and Plans for 1938." R. G. Calton, Tennessee Enamel Mfg. Co.

"Workable Control Systems and Benefits to the Enamel Plant." J. E. Hansen, Ferro Enamel Corp.

Thursday, Oct. 14

9:30 a.m.

"Enamel Shop Costs." Wade Willey, Kelvinator Corp.

"Simple and Practical Incentive Systems for Enamel Shops." R. M. James, Westinghouse Electric & Mfg. Co.

"Safety in the Enamel Plant."

"Plant Maintenance."

1:30 p.m.

"Welding." Walter W. Petry, Cincinnati Milling Machine Co.

"Drawing and Cleaning Compounds." D. J. Benoliel, Quaker Chemical Co.

"Nickel Treatment of Enameling Iron." James Pettyjohn, Mullins Mfg. Co.

"Enamel Process Inspection and Repair."

Friday, Oct. 15

9:30 a.m.

"Colors and Color Matching." A. J. Strod, Vitro Chemical Co.

"Structural Porcelain Enamel." A. C. Weirich, Davidson Enamel Products Co., Inc.

"Silk Screen Process."

"Drawing."

1:30 p.m.—Group Sessions

Hollow-Ware

"Pickle Room Practice, Part II." B. T. Sweely, Chicago Vitreous Enamel Product Co.

"Control and Consistency of Enamels for Dipping." Walter Wolf, Strong Mfg. Co.

(Two additional subjects to be selected.)

Cast Iron

"Effect of Modern Blast Furnace Practice on the Manufacture of Pig Iron." Wm. Curran, Republic Steel Corp.

"Molding Sand and Molding Practice." R. B. Schaal, Ferro Enamel Corp.

"Abrasive Cleaning Practice and Equipment." R. E. Donnally, Pangborn Corp.

"Discussion of Cast Iron Bulletin."

Sheet Iron

"Collection, Handling and Use of Reclaimed Enamel." G. N. Tuttle, Frigidaire Corp.

"Ground Coat Dipping."

"Cleaning and Pickling Practice." D. L. Bensinger, A. B. Stove Co.

"Control and Consistency of Enamels for Spraying." L. C. Athy, Porcelain Enamel Institute.

Famous for Fine Craftsmanship

A brilliant example of the lacquers of the Kang H'si period (1662-1722). A seat in green and buff

Collectors turn to the china of Kang H'si for lacquers; to the reign of Ch'ien Lung for carved jades; to the Ming and Tang dynasties for porcelains. For there and then were produced the supreme examples of craftsmanship in these arts. In this modern age there are close parallels in fine mechanical creations which are a joy to the knowing, discriminating eye. Hoover Ball and Tapered Roller Bearings *are* built too well to be cheap enough for ordinary use. But for that reason they definitely distinguish the machines they serve.

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Over 100 Power Salesmen Attend G.E. Heating Course

More than 100 power salesmen from leading electric-service companies in various parts of the country gathered in Schenectady, N. Y., last week for a five-day course, sponsored by General Electric Co., in industrial heating practices and applications. Attention was focused not only on the new types of equipment available and new developments in the art, but on potential markets for industrial heating as well. Factory trips for the purpose of demonstrating modern heat-treating equipment at work was also included. Principal speakers at a dinner meeting on Wednesday, September 22, were E. O. Shreve, vice-president in charge of sales, General Electric Co. and W. H. Sammis, vice-president, Commonwealth & Southern Corp.

The following papers were presented during the course of the meeting: "Furnace Brazing" by Glen Coley, Detroit Edison Co.; "Porcelain Enameling" by H. J. Babcock, Tennessee Electric Power Co.; "Steel Mill Furnace Applications" by J. L. Faden, Edison Company of Boston; "Scale-Free Hardening," by L. H. Knapp, Hartford Electric Co.; "Industrial Ovens," by A. H. Sherman, Industrial Furnace Manufacturers Association; "Arc Melting Furnaces," by D. T. Waby, Public Service Company of Northern Illinois; "Induction Heating and Melting," by Dudley Wilcox, Ajax Electrothermic Corporation; "Standard Heat-Treating Furnaces," by G. J. Hales, Cleveland Electric Illuminating Co.; "The Importance of Midget Heating Load," by D. H. Gerhard, Consumers Power Co.; "Selection and Application of Midget Heating Units," by James Bullock, Narragansett Electric Co.; "Electric Industrial Heating — Its Origin and Growth," by C. P. Yoder, Buffalo, Niagara and Eastern Power Co.; "Electric Heat in the Abrasive Industry," by H. A. Hands, New England Power Association. In addition to this other specialists of the General Electric Co. presented papers on subjects along these same lines, including the subject of annealing and air heating, soft-metal-melting applications, liquid immersion heating.

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HARTFORD CONNECTICUT, U. S. A.

A.S.T.E. Forms Chapter in Rockford, Illinois

A new chapter of the American Society of Tool Engineers was formed at Rockford, Ill., with a charter membership of approximately 100. The organization meeting was held at the Faust Hotel, Rockford, September 10. During the day all Rockford plants held open house for the new members of the Society and the national officers who were present.

New chapters will soon be organized at Flint, Mich., Baltimore, Md., and New York, according to Ford Lamb, executive secretary.

Four Railroad Associations Hold Meeting in Chicago

For the first time four specialized railway mechanical groups held their annual convention simultaneously. The Master Boiler Makers Association, the Car Department Officers Association, the International Railway General Foremen's Association and the Railway Fuel & Traveling Engineers Association held a joint meeting at the Hotel Sherman, Chi-

cago, Sept. 28–October 1. In conjunction with these meetings the Allied Railway Supply Association sponsored an exhibit of railway mechanical equipment and supplies in which about 100 companies participated.

The Master Boiler Makers Association held a two-day convention on September 29–30. This program included discussion on welding and cutting as used with the fabrication of boilers and tenders. The annual address was made by secretary-treasurer Albert F. Stiglmier, general boiler department foreman, New York Central, Albany, N. Y.

The following officers were elected: William N. Moore, general boiler foreman, Pere Marquette Railway Co., president; Carl A. Harper, general boiler inspector, Cleveland, Cincinnati, Chicago & St. Louis Railway, vice-president; Albert F. Stiglmeier, secretary-treasurer.

The International Railway General Foremen's Association elected F. B. Downey, assistant shop superintendent, Chesapeake & Ohio, president; J. W. Oxley, general foreman, Chicago & Northwestern, First vice-president; F. T. James, general foreman, Delaware, Lackawanna & Western, secretary-treasurer. L. H. Scheifele, Reading Co., spoke on "Can Modern Machine Tools Cut Repair Costs?"

Bradford Machine Tool Receivership Lifted

Bradford Machine Tool Co., Cincinnati, resumed operations on September 1 after a court order had been issued terminating receivership which has been in existence for 5½ years. W. R. Stuebing as receiver has been carrying on the business during that time. Operations will now be continued with J. R. Stewart as chairman of the board, S. S. Williams as president, and Charles J. Smith as secretary.

PERSONALS

C. P. RANDOLPH, formerly chief engineer, Edison General Electric Appliance Co., Chicago, has been elected vice-president in charge of engineering.

W. S. B. HENDERSON has been made head of the diversified division of Briggs Mfg. Co., Detroit, to succeed J. A. Callahan, resigned.

WILLIAM OCHSE has been appointed mechanical supervisor, R. Hoe & Co., Inc., manufacturers of printing presses, New York. Mr. Ochse was formerly works manager, Ohio Machine Tool Co., and later superintendent, Machinery Division, Pratt & Whitney Co., Inc.

RALPH L. WILSON, formerly metallurgical engineer, Timken Steel & Tube Div., Timken Roller Bearing Co., has become associated with the Climax Molybdenum Co., as metallurgical engineer in the development field, Canton, Ohio.

F. S. SPEAR will supervise the production of automotive, tractor, air conditioning and heating industry products for the Young Radiator Co., Racine, Wis.

FRANCIS W. MAGN, president, Industrial Controller Div., Square D Co., Milwaukee, Wis., has been elected a director of the Hein-Warner Motor Parts Co. Waukesha, Wis.

GEORGE H. BENDELL is now superintendent, Waukegan Plant, American Steel & Wire Co., to succeed the late W. E. ACOMB. R. SNOW will succeed Mr. Bendell as assistant superintendent.

ROBERT S. BROWN was given a testimonial dinner in honor of his 50 years of service with the New Britain Machine Co., New Britain, Conn., and its predecessor the Case Engine Co.

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THE SAME LAMINUM SHIM that saves precision machining, fitting, and factory assembly costs, gives users an easy, accurate service adjustment feature for the life of the equipment.
YOU SIMPLY PEEL your adjustments . . . one or more laminations at a time . . . from the solid laminated shim! Write for a sample of LAMINUM . . . either .002 or .003" laminations.
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LAMINATED SHIM CO., 21-14 44TH AVE., LONG ISLAND CITY, N. Y.
CLEVELAND DETROIT MILWAUKEE

MERRILL B. SANDS, has been elected president of the Dictaphone Co., Bridgeport, Conn., to succeed JAMES L. MCINTOSH, resigned. Mr. McIntosh is expected to continue with the company as vice-president in charge of financial affairs. CHARLES E. HALLENBORG has been named vice-president in charge of sales.

CHARLES H. KEENEY who prior to 1928 was connected with the Connecticut Blower Company, Hartford, Conn., has again become associated with the company as general manager and chief engineer. Mr. Keeney holds patents on 15 machines, products and systems in the air handling equipment line.

G. BLOCKSIDGE has been made assistant to the vice-president of the Westinghouse Electric International Co. Mr. Blocksidge has been with the company since 1906, and has been with the export branch since 1921.

JOHN MCC. LATIMER has been appointed representative in the Western Pennsylvania territory by Lukenweld, Inc., Coatesville, Pa. His headquarters will be in the Koppers Bldg., Pittsburgh.

G. R. MUNSCHAUER, president, Niagara Machine & Tool Works, Buffalo, N. Y., was honored with a testimonial ceremony on September 14 for his 40 years of service with the company. He has been president and general manager since 1918.

G. R. MUNSCHAUER

GEORGE S. CASE, JR., vice-president and general manager, The Lamson & Sessions Co., Chicago branch, has been transferred to the Birmingham branch to replace H. P. LADDS, resigned. WILLIAM M. OLSEN has been made vice-president and general manager of the Chicago branch. He has been with the company for 25 years. G. RIDER NEFF has been made manager of the Stove Bolt and Machine Screw Sales Department. ALEXANDER M. SMITH has been made assistant general manager of the Chicago branch.

W. CORDES SNYDER, JR., has been elected president, Lewis Foundry & Machine Co., Pittsburgh, a subsidiary of Blaw-Knox Co.

VIRGIL W. MCDANIEL is now general sales manager, The Eclipse Counterbore Co., Detroit, succeeding J. E. MACARTHUR, resigned.

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The correct oil film to each individual bearing... automatically
BIJUR
"Gallmeyer & Livingston" Grinder
AUTOMATICALLY Correct LUBRICATION
● The Bijur Automatic Lubricating System automatically feeds any number of bearings the metered oil film each requires. Maximum protection for machine life! Bearings, slides, gears . . . lubricated correctly, economically. None forgotten. ● Insure high-speed runs with new-machine accuracy. Avoid expensive production delays. Cut maintenance costs. Protect your investment! . . . With BIJUR.
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Foundry Equipment Makers to Hold Fall Meeting

A Fall meeting of manufacturers of foundry equipment will be held at the Greenbriar Hotel, White Sulphur Springs, W. Va., October 18-19, according to an announcement by Arthur J. Tuscany, executive secretary, Foundry Equipment Manufacturers Association, Penton Building, Cleveland, Ohio.

The meeting of this group is intended for all manufacturers of equipment used in foundries, regardless of whether they are members of the association or not.

The Steel Founders Society is meeting at nearby Homestead Hotel, Hot Springs, Va., at the same time, and the Conveyor Association will also be in session at White Sulphur Springs.

BUSINESS ITEMS

R. C. A. Mfg. Co., Inc., is planning the construction of a new R.C.A. Radiatron factory building at Harrison, N. J. for the manufacture and storage of television tubes. Estimated cost is between $750,000 and $1,000,000.

The Morrison Steel Products Co., Inc., manufacturer of automobile truck panels, cowls and other steel parts, has purchased the plant of the American Lithographing Co., Buffalo. Operations will begin in the new plant by November 16 with approximately 250 workers employed according to JACOB J. MORRISON, president.

The Douglas Aircraft Co. is adding 120,000 sq.ft. to its plant at 3000 Ocean Park Blvd., Santa Monica, Calif., at an expected cost of $200,000. Employment at this plant is 10,000.

A. C. Gilbert Co., manufacturer of electric motors, fans, heaters and parts, New Haven, Conn., plan a three-story addition to cost $75,000 with equipment.

The following last minute changes have been made in booth assignments for Metal Show exhibitors:

ADDITIONAL EXHIBITORS:

American Screw Co. (H-85)
Baker & Co. (A-19)
Bonney Forge & Tool Works. (H-83)
Electric Arc Cutting & Welding Co. (C-5)
Illinois Tool Works. (B-10)
Pyro-Electric Instrument Co. (G-40)
Roxalin Flexible Lacquer Co. (A-86)
A. O. Smith Corp. (C-2)

CHANGES IN BOOTH NUMBER:

Quigley Co., Inc. (E-2 changed to H-74)
Sleeper & Hartley, Inc. (H-65 to H-17)

WITHDRAWN:

Colomonoy Co. (G-76)
Heppenstall Co. (B-1)

The Hawaiian Pineapple Co. plans a million dollar can manufacturing plant in Honolulu to produce the 150 million cans of various sizes used yearly by the company and which have been furnished heretofore by the American Can Co.

Harris Hardware & Mfg. Co., Inc., New York, plans a new 6-story plant to cost approximately $600,000.

Hayes Equipment Mfg. Co. and Clear Vision Pump Co., Wichita, Kans., have been combined and will be known as Hayes Equipment Mfg. Co. J. C. CRONKHITE is president; ROY STREETER, vice-president; A. F. MCMASTER, secretary-treasurer; DR. C. I. MAGGART, chairman of the board; A. C. RIGGS, sales manager; and WALTER HICKMAN, factory superintendent.

Rheem Mfg. Co., manufacturer of tanks, will erect an addition to its plant in Los Angeles, to cost $45,000.

Graham Transmission, Inc., formerly at Springfield, Vt., has moved its general offices to 739 North Broadway, Milwaukee.

The McKay Co., manufacturer of chain and metal furniture, established a new division for the manufacture of shielded-arc welding electrodes. The plant for this division will be established in York, Pa. L. E. FAULKNER is chief chemist for the new plant. M. J. VAN DRESER is engineer in charge of the electrode sales and service staff. T. J. MCKAY, JR., is responsible for sales promotion and coordination of engineering and plant activities with sales demands.

Air-cooled Motors Corp., formerly the Doman Marks Engine Co., Inc., Syracuse, N. Y., has acquired the patents, trademark and trade name of the H. H. Franklin Mfg. Co., according to LEWIS E. PIERSON, JR., president. The Syracuse plant of the H. H. Franklin Mfg. Co. has recently been sold to the Carrier Corporation. E. F. MARKS and CARL DOMAN, the chief engineer and the experimental engineer, respectively, for Franklin, head the technical and production staffs. The company will hereafter designate its engines as "Franklin Air-Cooled Heavy Duty Engines".

Wrought Washer Mfg. Co., engineers and manufacturers of washers and stampings, Milwaukee, Wis., is celebrating the 50th anniversary of the founding of the company by FRED DOEPKE.

Booth B-48 National Metal Exposition
Atlantic City October 18-22, 1937
Step in and Ask for Your Free Souvenir

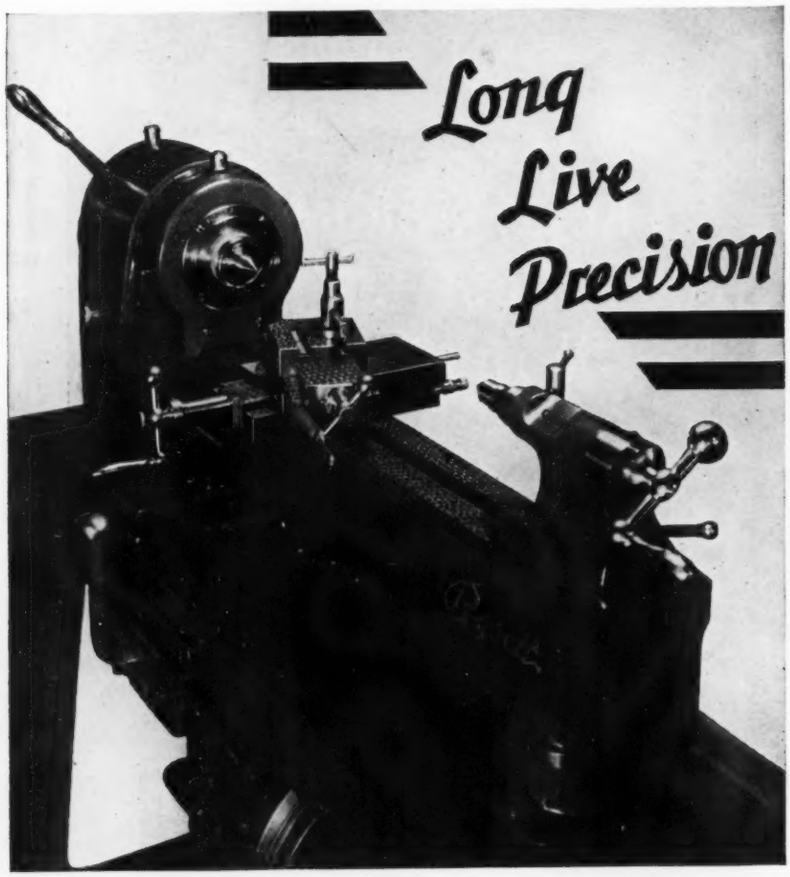
G. S. Blakeslee & Co., manufacturer of degreasing machines and metal parts washers, announce construction has begun on a two-story addition which will add 50 per cent space to its present plant in Cicero, Ill.

General Spring Co., manufacturer of coil wire and other steel springs, Cincinnati, plans a one-story plant unit to cost approximately $70,000 with equipment.

Bridgeport Metal Goods Mfg. Co., Cherry St., Bridgeport, Conn., manufacturer of metal products plans a one-story addition to cost approximately $50,000.

Sherman-Klove Co., manufacturer of screw machines, mechanics, hand tools, sheet metal specialties, Chicago, plans a one-story addition of approximately 64,000 sq.ft. which is expected to cost about $200,000 with equipment. Part of the new space will be used by Brazil Stamping Co., a subsidiary.

Johnson Machine & Press Corp., Elkhart, Ind., has been formed to manufacture punch presses and other machinery. Incorporators are J. C. BONTRAGER, G. O. JOHNSON, C. A. LARSON, D. P. HUFFMAN, S. E. JOHNSON, C. A. SWIKERT and H. G. MCCABE.



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Maximum slide areas — sturdy construction — three point bed mounting — perfection in material and workmanship

RIVETT LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS.
PIONEERS IN BENCH LATHE DEVELOPMENT

Modern Tool Works Div., Consolidated Machine Tool Corp., Rochester, N. Y., has appointed B. L. DIAMOND as Detroit representative, to succeed FORD R. LAMB, who is now executive secretary for the American Society of Tool Engineers.

Whitehead Metal Products Co., New York, is planning the erection of a new plant at 4801 E. 50th St., Los Angeles, Calif., for the manufacture of Monel products. The factory is expected to cost $100,000. RALPH H. BAILEY is to be plant manager.

Westinghouse Electric & Mfg. Co., East Pittsburgh, plan a factory branch, storage and distributing plant at South Boston, to cost approximately $350,000 with equipment.

American Rolling Mill Co. plans to spend $2,000,000 for improvements at its Butler, Pa., plant, according to GEORGE M. VERITY, chairman.

The Lincoln Electric Co., Cleveland, announces that J. M. ROBINSON has organized The Robinson Welding Co., Detroit, and will handle Lincoln products exclusively.

Salem Engineering Co., Salem, Ohio, appointed LATIMER KOVARIK, 408 S. Graham St., Pittsburgh, as their representative in that territory, and PRESLEY HAMILTON, 149 Broadway, as New York representative.

Crucible Steel Co. of America has appointed Peter A. Frasse & Co., Inc., New York, as distributor for its high speed and tool steels in the New York, Philadelphia, Buffalo, Rochester, Syracuse, Hartford and Baltimore districts.

The Lincoln Electric Co., Cleveland, appointed W. R. PERSONS as manager of its Pittsburgh Welding Sales. He will be assisted by J. H. PAINTER, M. S. SCHONVIZNER, R. H. SCHUSTER and H. E. WHITE.

Ohio Crankshaft Company to Double Plant Capacity

Construction is well underway on the Ohio Crankshaft Co. new plant at East 42nd & Harvard Ave., Cleveland, according to W. C. Dunn, president.

New plant will occupy 75,000 sq. ft. on a new eighteen acre site and is expected to require approximately $400,000 worth of equipment. It is expected that the present force of 400 will be increased by another 300 when the plant is finished.

A $100,000 laboratory for research on the "Tocco Process" is included in the plans. New equipment to be installed will machine and harden crankshafts weighing up to 2,000 lbs., similar to those used in locomotive diesels.

OBITUARIES

HOWARD C. HUNT, vice-president and treasurer, The National Automatic Tool Co., Richmond, Indiana, died September 22. He was 47 years old and had been with the company since 1916.

WILLIAM G. COSTIN, chairman of the board and treasurer, Pitsburgh Screw & Bolt Corp., Pitsburgh, died September 21 at the age of 62. He had served with the company for 42 years.

JOHN G. RALSTON, president, Reynolds Wire Co., Dixon, Illinois, died September 22 at the age of 59.

JOSEPH J. BRAUN, JR., vice-president and sales manager, Braun Gear Corp., Brooklyn, N. Y., died Sept. 21 at the age of 41. Mr. Brown had been associated with the company, which was founded by his father in 1908, for 22 years.

WILLIAM C. KRAMER, Singer Mfg. Co. Elizabeth, N. J., died Sept. 22 at the age of 71.

J. BAYARD HEARN, assistant to the president, Lobdell Car Wheel Co., died Sept. 22, at the age of 57.

JOHN LEONARD TAYLOR, founder and president, Taylor Mfg. Corp., Milwaukee, died September 7 at the age of 51. Mr. Taylor was a noted inventor of precision instruments and special purpose machinery.

CHARLES ARMBRUSTER, inventor of the automatic die for making lock parts, died September 28 at the age of 81. He had been with the Eagle Lock Co., since he was thirteen years old and had been foreman of the automatic die department for 30 years.

EDWARD H. TEALL, president and general manager, H. P. Synder Mfg. Co., Little Falls, N. Y., died September 9.

WHITFIELD CLARK, vice-president, Kilby Car & Foundry Co., Anniston, Ala., died September 11. He was also president of the M. & H. Valve & Fittings Co.

MEETINGS

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Annual meeting. New York, N. Y. December 6-10. Secretary, 29 W. 39th St., New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Welding Committee and Machine Shop Practice Division. Atlantic City, N. J., Oct. 18–22.

CHICAGO EXPOSITION OF POWER AND MECHANICAL ENGINEERING. New International Amphitheatre, Chicago. October 4–9. CHARLES F. ROTH, vice-president, International Exposition Co., Grand Central Palace, New York.

INTERNATIONAL ACETYLENE ASSOCIATION. 38th annual convention. Birmingham, Alabama. November 10-12.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION. Fall meeting. Greenbriar Hotel, White Sulphur Springs, W. Va. October 18–19. ARTHUR J. TUNSCANY, executive secretary, Penton Building, Cleveland, Ohio.

NATIONAL AUTOMOBILE SHOW. New York. Oct. 27-November 3.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION Annual meeting. Chicago. Oct. 24–29. W. J. DONALD, managing director, 155 E 44th St., New York.

NATIONAL MACHINE TOOL BUILDERS ASSOCIATION. Annual Convention. Hot Springs, Va., Oct. 25–27.

NATIONAL SAFETY COUNCIL. Annual meeting. Kansas City, Mo. Oct. 11–15. W. H. CAMERON, secretary, 20 N. Wacker Drive, Chicago.

PORCELAIN ENAMEL INSTITUTE. Seventh annual meeting, Chicago, Ill. October 11–12.

PORCELAIN ENAMEL INSTITUTE. Second forum. Ohio State University, Columbus, Ohio, October 13–15.

SOCIETY OF AUTOMOTIVE ENGINEERS. National aircraft production meeting. Los Angeles, Cal., Oct. 7–9.

15"x6' South Bend Quick Change Gear Underneath Belt Motor Driven Precision Lathe on a manufacturing operation.

POWER and rigidity in production, accuracy and precision in tool and gauge work, and versatility in many different operations are characteristics required of the new 15-inch South Bend Series "T" lathe in hundreds of manufacturing plants, tool rooms, and machine shops. The fine workmanship, design, and new features of this lathe, combined with its smooth, quiet operation, assure quick and accurate handling of machining operations to the most exacting specifications.

68 Sizes and Types of Lathes for every purpose.

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11" lathe prices start at $371
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Bulletin No. 15-C illustrates, describes and prices the different models of the 15-inch lathe. Copy sent free, upon request.

SOUTH BEND LATHE WORKS

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SOUTH BEND *Precision* LATHES

MODERN LATHES FOR MODERN INDUSTRY

PATENTS

September 14, 1937

Metal-Working Machinery

Grinding Machine. Raymond H. Cramer, Newark, N. J., assigned to General Motors Corp., Detroit. Patent 2,092,876.

Grinding Machine. Clarence C. Stevens, Forestville, Conn., assigned to General Motors Corp., Detroit. Patent 2,092,895.

Thread Milling Machine. Newman M. Marsilius, Bridgeport, Conn., assigned to The Bridgeport Bronze Co., Bridgeport. Patent 2,093,050.

Furnace. David A. Wallace, Detroit, assigned to Chrysler Corp., Highland Park, Mich. Patent 2,093,061.

Wire Forming Machine. Mauritz Olson, Bridgeport, and Richard A. Johnson, Fairfield, Conn., assigned to The A. H. Nilson Machine Co., Bridgeport, Conn. Patent 2,093,173.

Multiple Spindle Drilling Machine. Fritz Walther, Plauen in Vogtland, Germany, assigned to Vomag-Betr.ebs-A. G., Plauen in Vogtland, Germany. Patent 2,093,343.

Machine for Grinding Cylindrical Bodies. William Ogilvie, Knowle, England, assigned to B. S. A. Tools Ltd., Birmingham, England. Patent 2,093 363.

Heat-Treating Furnace. Ernest W. Weaver and Joseph A. Reece, Toledo, Ohio, assigned to Surface Combustion Corp., Toledo. Patent 2,093,376.

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Pittsburgh, Pa.
Mills at Ambridge, Pa. and Chicago, Ill.
Manufacturers of Carbon and Alloy Steels
Turned and Polished Shafting, Turned and Ground Shafting, Wide Flats up to 12" x 2"

Parts and Mechanisms

Blowpipe Lighter. Herbert W. Cowin, Westfield, and Wilgot J. Jacobsson, Elizabeth, N. J., assigned to Union Carbide and Carbon Corp., New York. Patent 2,093,034.

Fluid Pressure Chucking System. Donald H. Montgomery, Berlin, Conn., assigned to The New Britain Machine Co., New Britain. Patent 2,093,111.

Stock Feed Mechanism. Donald H. Montgomery, Berlin, and Arthur H. Jobert, New Britain, Conn., assigned to The New Britain Machine Co., New Britain. Patent 2,093,112.

Processes

Manufacture of Flexible Metal Tubes. Rene Tondeur, London, England, assigned to Bowden (Engineers) Ltd., Willesden Junction, England. Patent 2,093,899.

Process for Cleaning Greasy Surfaces. Wesley W. Holmquist, Minneapolis, Minn. Patent 2,093,240.

Tools and Accessories

Boring Tool. John P. Francesco, Haverhill, Mass. Patent 2,092,755.

Universal Valve Tool. William Trefney, Jamaica, and Ernest Edward Condon, Flushing, N. Y., assigned to C-Y Mfg. Co., Jamaica, N. Y. Patent 2,092,941.

Welding Electrode Holder. Oscar W. Myers, United States Navy. Patent 2,092,771.

Cutting Tool. John H. Muth, East Cleveland, Ohio. Patent 2,092,984.

Lathe Dog. George S. L. Wilson, Eastport, Md. Patent 2,092,997.

Cutting Tool (Belt). John C. Olsen, Chicago, assigned to Flexible Steel Lacing Co., Chicago. Patent 2,093,022.

Gage (Dial). Warren Ames, Newton, Mass. Patent 2,093,066.

Pneumatic Grinding Tool. William T. Jaynes, Detroit. Patent 2,093,360.

September 21, 1937

Metal-Working Machinery

Apparatus for Electroplating Sheet Metal. Max Schlötter, Berlin, Germany. Patent 2,093,484.

Drilling and Tapping Machine. Joseph F. Buhr, Ann Arbor, Mich. Patent 2,093,546.

Machine Tool (Lathe-Hydraulic). Louis Edward Godfriaux, Madison, Wis., assigned to Gisholt Machine Co., Madison. Patent 2,093,757.

Rolling Machine. Charles W. Sinclair, Detroit, assigned to Kelsey-Hayes Wheel Co., Detroit. Patent 2,093,933.

Parts and Mechanisms

Tap Structure. John S. Bartek, Rochester, N. Y., assigned to Consolidated Machine Tool Corp., Rochester. Patent 2,093,507.

Boring Head. Edward C. Steiner, Bridgeport, Conn. Patent 2,093,743.

Welding. Paul M. Conrad, New Kensington, Pa., assigned to Aluminum Co. of America, Pittsburgh. Patent 2,093,881.

Dividing Apparatus for Machine Tools. Herbert Lindner, Berlin. Patent 2,093,917.

Processes

Method and Apparatus for Brazing. Cecil A. Mann, Dayton, Ohio, assigned to General Motors Corp., Dayton. Patent 2,093,814.

Tools and Accessories

Thread Forming Chaser and Supporting Means Therefor. John S. Bartek, Rochester, N. Y., assigned to Consolidated Machine Tool Corp., Rochester. Patent 2,093,506.

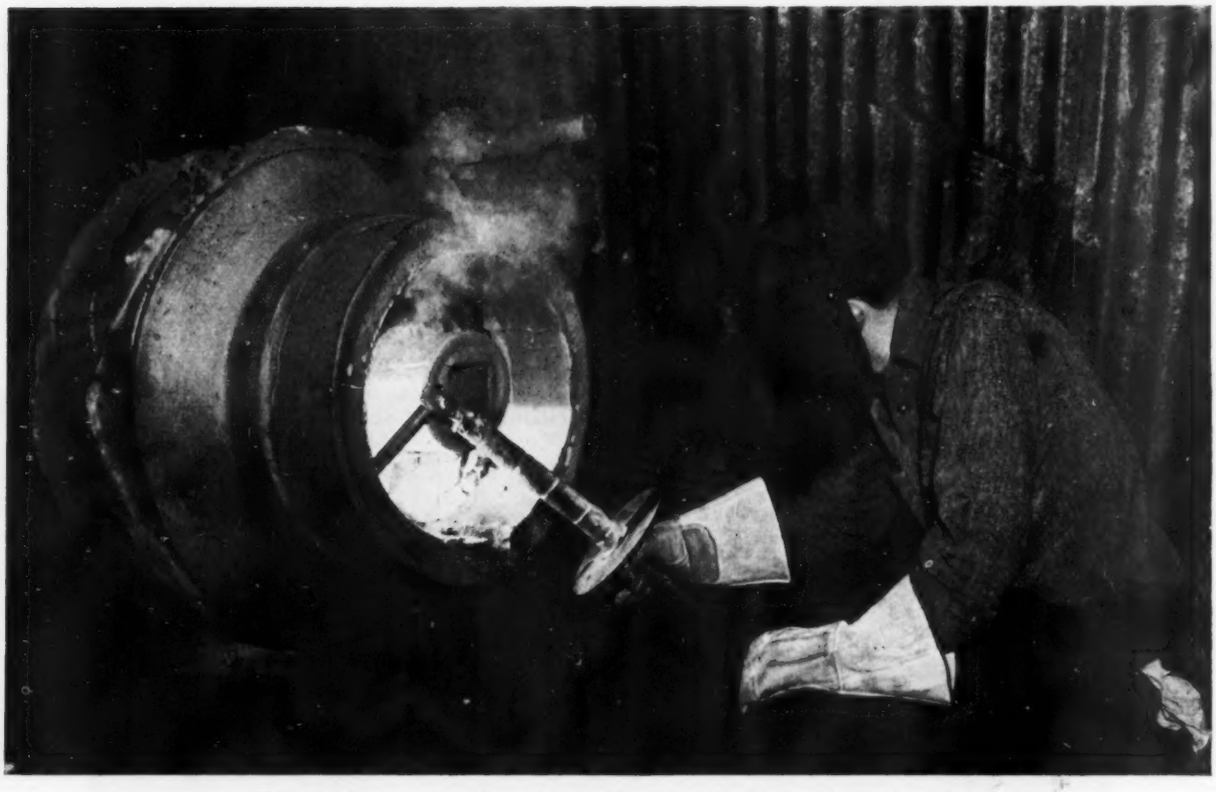
Soldering Tool. Joseph Petti, Brooklyn, N. Y. Patent 2,093,527.

Circular Cutting Tool. Evans M. Staples, Cincinnati, Ohio. Patents 2,093,742; 2,093,985.

Metal Cutting Tool. Archibald L. Wallace, Long Island, N. Y. Patent 2,093 987.

Welding

Gas and electric welding form modern means of metal fabrication that daily find a widening field of usefulness



Risers and gate are cut from a bronze impellor wheel using the carbon arc

Metal Cutting With the Electric Arc

Ferrous and non-ferrous metals may be cut electrically either with graphite or fluxed electrodes

CHARLES H. JENNINGS
Research Welding Engineering
Westinghouse Electric & Manufacturing Company

THE PROCESS of arc cutting is purely a method of applying the heat energy of the electric arc to melt the metal along a desired line of cut. Arc cutting does not equal gas cutting from the standpoint of smoothness and quality of the cut surfaces, but with reasonable skill and experience, a very neat cut can be made on steel plates as shown by Fig. 1. In applications where smooth, uniform cut surfaces are not essential as in the cutting of scrap materials, casting risers, etc., it is much cheaper than gas cutting. Arc cutting has a definite advantage over gas cutting in that it is not restricted to ordinary ferrous metals, but is equally adaptable to alloy steels, cast iron, and all types of non-ferrous metals.

In addition to seam cutting, electric arc cutting has been successfully applied to rivet cutting and hole piercing.

The process of carbon arc cutting consists essentially of drawing an arc between a carbon or graphite electrode and the material to be cut, and allowing the heat of the arc to melt away the material. Direct current energy is generally used with the carbon electrode negative (straight polarity) although alternating current energy can also be used.

Soft carbon electrodes are sometimes used for arc cutting, but they are not generally recommended because of their short service life resulting from the heavy current values required in arc cutting. Graphite electrodes have a service life many times that of carbon electrodes and have consequently found general acceptance for this class of work. Graphite electrodes will also retain a point longer than carbon electrodes

and this is an essential factor where clean, smooth cuts are required.

The heavy currents required in arc cutting render electrode holders of the type ordinarily used for arc welding unsuitable except when small diameter electrodes are used. For small electrodes, an adaptor of the type shown in Fig. 2 has been found satisfactory. For large diameter electrodes, special holders are desirable. These holders contain a long shank, a hand shield to protect the operator's hands from the intense heat and a special gripping mechanism for holding the electrode.

The manipulation of the cutting arc is simple. When cutting thin plates (½-in. or less) the arc is simply advanced along the section to be cut at a rate equal to that at which the metal is melted away. The cutting operation may be done with the plate in the horizontal, inclined or vertical positions. The most smooth and uniform cuts are obtained with the plate in the horizontal plane.

Electrode Positioning

The angle at which the electrode is held depends upon the plane of the plate being cut. In horizontal cutting, the electrode may be held either vertical or pointing slightly forward. When cutting plates in the inclined or vertical planes, the electrode should be pointed downward.

When cutting materials heavier than ½ in., the process consists of progressively melting away the vertical face of the cut. The procedure generally employed in this case is to work from the top to the bottom of the plate thereby having the bottom of the cut advanced slightly ahead of the top of the cut. (See Fig. 3). This method of procedure produces an undercut which permits the molten metal to run out more easily.

The speed of cutting increases with increased current. The width of the cut increases with increased current values and electrode diameters. The skill of the operator also has a large influence on the width of the cut.

Recommended current values for different size graphite electrodes are given in Table I.

TABLE I—Current Values for Various Sizes of Graphite Electrodes

Electrode Diameter	*Current Values*
¼ in.	up to 200 amps.
⅜	200—400
½	300—600
⅝	400—700
¾	600—800
⅞	700—1000
1	800—1200

The fact that arc cutting depends entirely upon melting away the material by the heat of the arc, rather than the process of oxidation as in the case of gas cutting, makes it possible to cut cast iron and rolled steel at approximately the same rate. Typical cutting speeds of cast iron and steel plates are given in Table II. Cutting speeds for circular cast iron and steel bars are given in Table III. These data are given in curve form in Figs. 4 and 5.

TABLE II — Approximate speed of Cutting Steel and Cast Iron Plates

Thickness of Material in inches	*Cutting in amps.*	*Cutting Speed in./min.*
¼	400	15
⅜	400	12
½	400	10
⅝	400	7
¾	400	4
1	600	3.2
1½	600	2.4
2	600	1.8
3	600	1.1
4	600	0.7
6	800	0.4
8	800	0.3
10	800	0.2
12	800	0.15
14	1000	0.10
16	1000	0.06

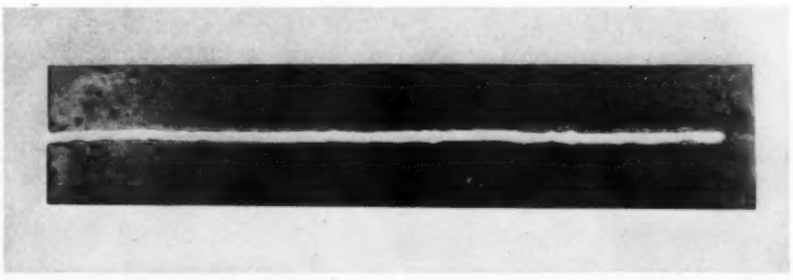
Note: To obtain the cutting speed in feet per hour, multiply in. per min. by five.

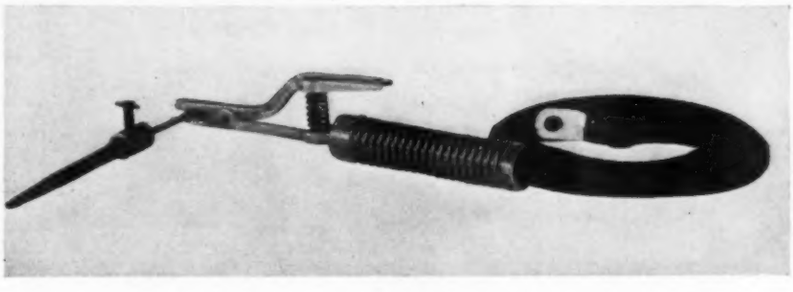
TABLE III — Approximate Speed of Cutting Circular Steel and Cast Iron Bars

Diameter of Bar in inches	*Current in amps.*	*Time in min.*
½	400	0.25
1	600	0.5
1½	600	0.8
2	600	1.0
2½	600	1.6
3	600	2.0
4	600	3.2
5	600	5.0
6	800	6.5
7	800	9.0
8	800	13.0
10	800	23.0
12	800	37.0

Fig. 1—This cut was made in ½-in. steel plate with the carbon arc

Fig. 2—A carbon electrode adaptor has been designed to use with standard electrode holders





Rivet Cutting

The arc cutting process is used extensively for cutting rivets. It has been found to be one of the cheapest and quickest methods of removing rivet heads, and it does not involve the disadvantages of some of the other processes. It eliminates the danger of the mechanical rivet busters and does not produce undercutting of the plates as is generally the case when using the gas torch.

When cutting rivets, the best results are obtained with the plates in the vertical position. If the plates are in the horizontal position, rivet heads may be successfully cut from either the top or bottom sides of the plates. When cutting rivets from the top of the plate, it is necessary to remove the molten metal by an air

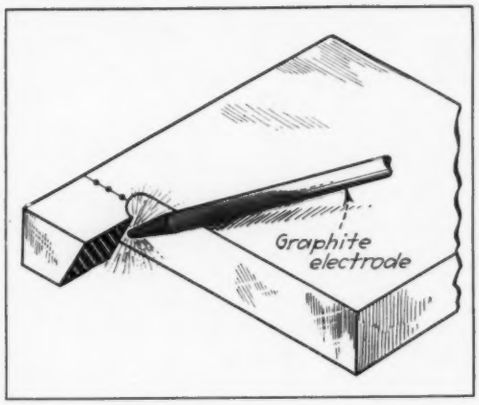


Fig. 3—In cutting thick plates the bottom of the cut is advanced slightly ahead of the top of the cut

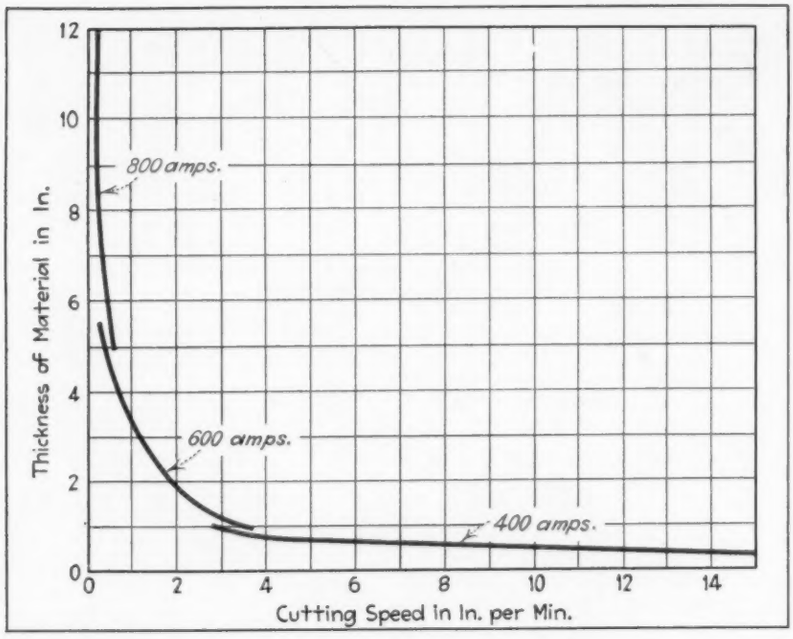
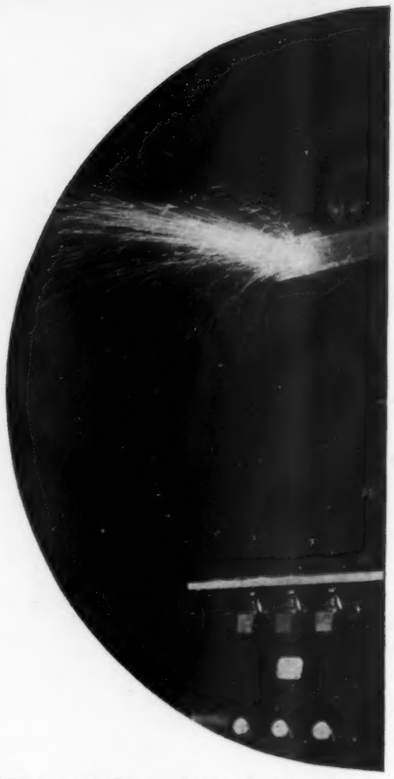


Fig. 4—Approximate speed of cutting steel and cast iron plates



Where a hole or change in structure is

blast or by mechanical means. If the rivet head is cut from the bottom of the plate, the force of gravity will remove the molten metal as is the case when removing rivets from vertical plates.

If it is desired to salvage the rivet plates, the arc should not be struck on the plates as this is likely to burn a depression in them. The arc should be struck on the rivet head and a slight rotary motion applied, care being taken not to concentrate the arc too long at the periphery of the rivet head.

The removal of rivets by the arc process is used extensively by railways in rebuilding freight cars because of its economic advantages. Average operators can cut 1800 to 2000 rivets a day while in some cases this number can be increased 50 per cent.

For the best results in rivet cutting, $\frac{1}{2}$ to $\frac{5}{8}$-in. graphite electrodes should be used with 400 to 600 amperes of current.

Coated Electrodes

The major portion of all arc cutting is done with graphite or carbon electrodes, but it is desirable to point out the application of coated electrodes for this process. The application of coated electrodes to cutting is not always an economical process because of the cost of the electrodes, but it has certain merits. It has been found particularly advantageous in cases where a small job of cutting is required and an oxyacetylene torch or carbon electrode is not available for this purpose.

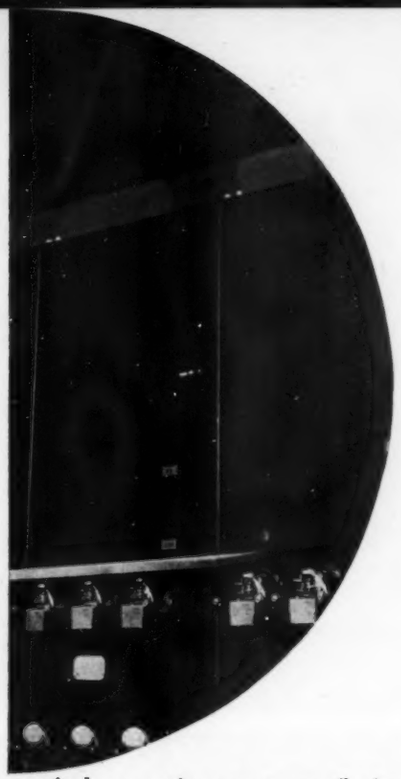
Electrodes with both gaseous and slagging type coatings can be used for arc cutting, but in general, the latter type gives the better results because they will handle higher current densities.

The speed of arc cutting with coated electrodes depends upon the electrode diameter and the cutting current. The width of the cut is approximately constant for all electrodes up to $\frac{1}{4}$-in. in diameter. Electrodes smaller than $\frac{5}{32}$-in. in diameter are not suitable for arc cutting because they heat up quickly and melt away under the high currents employed.

Plate up to $\frac{1}{8}$-in. thick can be cut by simply moving the electrode along the line of cut. On heavier plates it is desirable to point the

TABLE IV—Approximate Cutting Speeds of Cast Iron and Steel Plates with Coated Electrodes

Plate Thickness in inches	*Cutting Speeds in in./min.*		
	5/32-electrodes	*3/16-electrodes*	*1/4-electrodes*
$\frac{1}{4}$	12.0	15.0	21.0
$\frac{1}{2}$	7.0	9.0	11.0
$\frac{3}{4}$	4.25	5.5	6.7
1	2.5	3.7	4.6
$1\frac{1}{4}$	1.6	2.4	3.2
$1\frac{1}{2}$	1.0	1.7	2.3
$1\frac{3}{4}$	0.6	1.3	1.8
2	0.4	1.0	1.4



required, arc cutting may prove effective

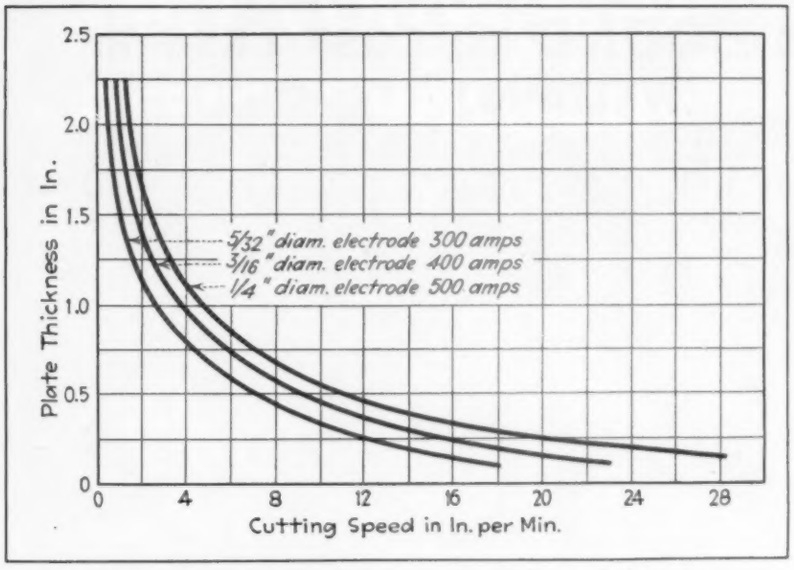


Fig. 6—Approximate speed of arc cutting with coated electrodes

electrode forward and move the electrode from the top to the bottom of the cut so as to have the bottom of the cut slightly advanced. (Similar to the carbon arc cutting process illustrated in Fig. 3.)

Cutting speeds obtained on steel and cast iron plates with different diameters of electrodes are given in Table IV. These values were obtained with slag coated electrodes. These data are given in curve form in Fig. 6.

Alloy steels and many non-ferrous metals can be readily cut by the coated electrode cutting process. In these cases it is often desirable to use coated electrodes of an analysis somewhat similar to the plate being cut. In many cases cuts of this type can be made on special alloy steels without adversely affecting the metallurgical characteristics.

Hole Piercing

In addition to seam cutting, coated electrodes can also be used to pierce holes in plates. Hole piercing has many applications in cases where a hole is desired and it is impractical to punch or drill it. This process is inexpensive and quick.

The application of coated electrodes to hole piercing is dependent upon the formation of a crater at the end of the electrode which is the result of the steel core melting away in advance of the surrounding coating. After the crater has been formed it is possible to push the electrode against the plate without shorting the circuit. Upon pushing the electrode against the plate, the protruding coating and not the metal core touches the plate. Consequently, there is still a gap between the metal conductors and the electric arc does not become extinguished by the action.

High Current Required

Hole piercing is done by applying high currents to the electrodes. The arc is drawn at the point where the hole is to be pierced and the electrode moved in a circular motion equal to the diameter of the hole to be pierced until the surface is melted. Following this, the electrode is pushed down against the molten metal and the circular motion continued. The continued application of pressure while rotating the electrode will cause the electrode to melt a hole through the plate. If the process is properly carried out, clean, circular holes can be produced, and little difficulty will be experienced.

Acknowledgment: The writer wishes to acknowledge the pioneering work done by O. H. Eschholz on arc cutting from which much of the data on graphite electrode cutting speeds were taken.

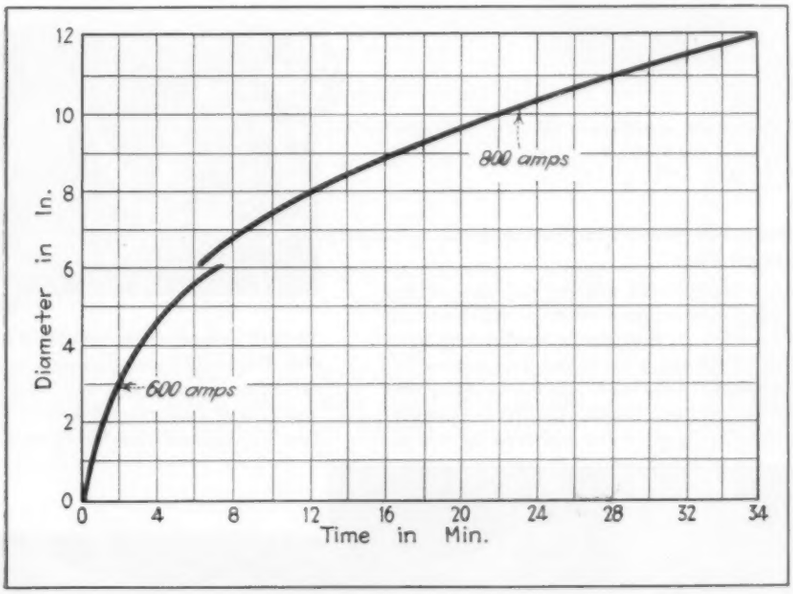
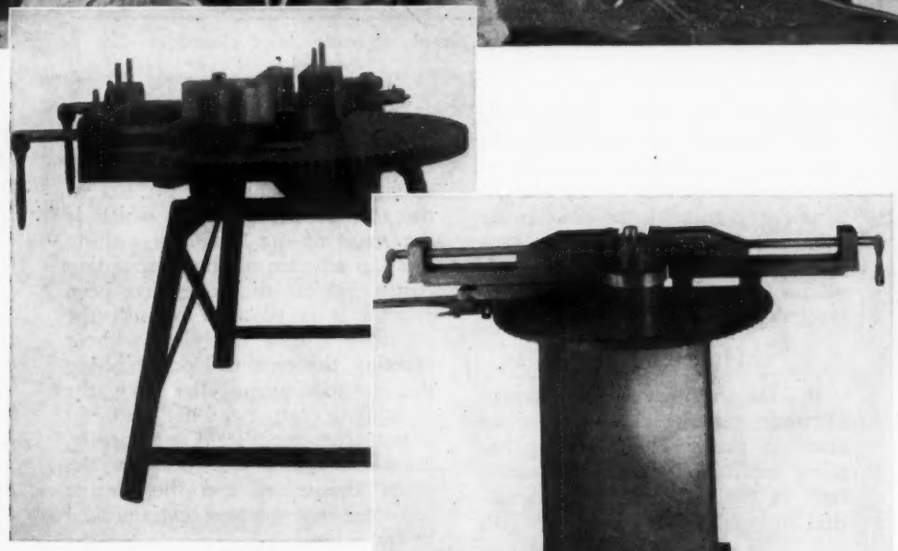


Fig. 5—Approximate speed of cutting circular steel and cast iron bars

BILL, YOU HAVEN'T THE RIGHT ANSWER. TRY AGAIN. IT'S *BOUND* TO COST LESS BY WELDING.



Saved $28 on the Rack Top Plate Alone—*Redesign of this bar bending machine cut costs on every part. The rack top plate alone was reduced from $60 to $32. The weight of the machine was reduced from 1250 lbs. to 736 lbs. The welded machine can be operated by one man whereas the old one required two men. And note how the appearance has been improved.*

Courtesy of Wallace Supplies Mfg. Co., Chicago, Ill.

The Welded Treadle Costs 45c Less—*Built from a piece of 2-inch channel and a checkered plate, this welded foot treadle costs only 73 cents—38% less than the old design. In addition, the welded part is unbreakable.*

Courtesy of Jones Superior Machine Co., Chicago, Ill.

This Change-Over Yielded 88c Per Part—*This cast iron sheave housing for a gas reducing valve was changed to welded design, using standard steel shapes. Cost was reduced from $2.65 to $1.77.*

Welded Steel is Stronger—This Manufacturer Proved Its Superiority by Actual Destruction Test

Supported at both ends and loaded at the center, the cast steel design shown below failed at 61,760 lbs. Under the same set-up, the welded steel design shown at the right withstood a loading up to 105,000 lbs. The weight and cost of each is practically the same.

This test was made by the Athey Truss Wheel Co., Chicago, to prove the superiority of their new welded rocker beam for "Forged-Trak" wheels.

The welded design employs 5/16" pressed steel stampings as the main members. Hubs are cast steel. The part is welded in a positioning jig so that all welding is downhand. Two passes of 1/4" "Fleetweld 7" are used. The total welding time is 3 hours. A new "Shield-Arc SAE" welder contributes to the speed and quality of the welding.

THIS MANAGER, FIRMLY CONVINCED THAT WELDED DESIGN WILL CUT COSTS AND IMPROVE THE PRODUCT, IS *BOUND* TO INCREASE THE PROSPERITY OF HIS COMPANY

Today, countless manufacturers of iron and steel products are more firmly established and are enjoying good fortune because of one lone individual in the organization—an enthusiast for welded design.

This engineer or manager wages a determined drive to apply welded fabrication to *every* product which his company manufactures. He succeeds because he stands by his guns. If first attempts fail, he tries again...and again. He believes in welding because—

HE KNOWS that rolled steel costs ⅓ to ½ as much as the traditional material.

HE KNOWS that welded fabrication eliminates pattern costs.

HE KNOWS that welded steel designs are from 2 to 6 times as strong as the cast designs which they replace.

HE KNOWS that welded steel construction permits the use of steels of various types and that they can be combined in a part to give any desired service qualities.

HE KNOWS that welded steel permits greater freedom on the part of the designer to improve the appearance of the product.

HE KNOWS that the more welding he can put in his shop, the more he will absorb his company's fixed charges.

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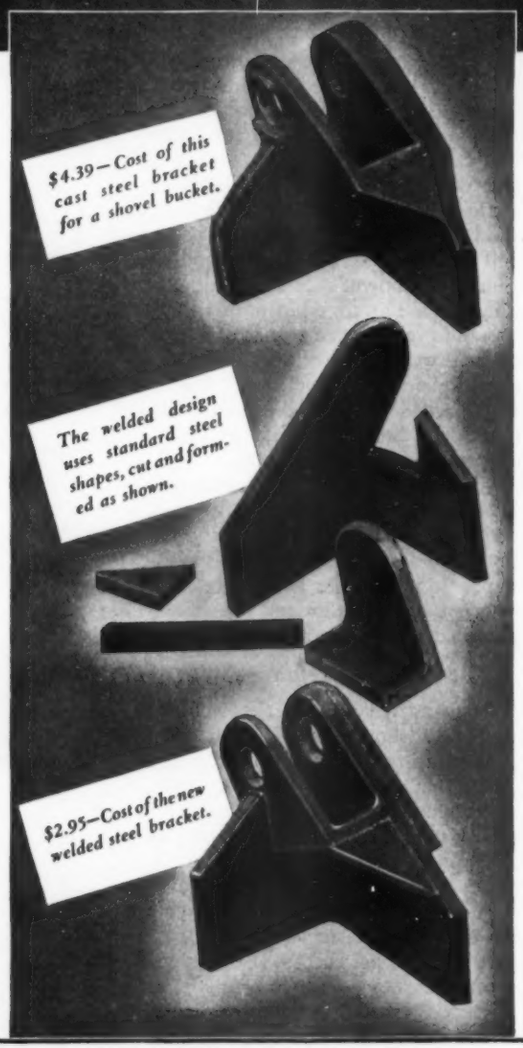
You can start welding easily and with little investment in equipment because you can change over one part at a time. May we be of assistance to you? THE LINCOLN ELECTRIC COMPANY, Dept. A -426, Cleveland, Ohio.


$4.39—Cost of this cast steel bracket for a shovel bucket.
The welded design uses standard steel shapes, cut and formed as shown.
$2.95—Cost of the new welded steel bracket.

THE LINCOLN ELECTRIC COMPANY
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BUILDS LIGHTER AND STRONGER PRODUCTS...FASTER...AT LESS COST

Fixture-Tables Control Special-Welder Economy

Ten average table applications show how fixtures can be gotten into and out of the welding position

H. W. ROTH
President, Roth Welding Engineering Company

HYDROMATIC welding, originally developed for the automotive industry, has also proved a successful and economical method for sheet-metal assembly in general. This is true wherever the production is large enough to justify the application of special machines.

The principle of this method is generally known. Small hydraulic cylinders are arranged in proper location and actuated in succession to operate welding electrodes. At the opposite side, the sheet metal is usually backed up by dies, correctly shaped to hold the parts in place, and to assure proper contact.

The principal part of the machine is the hydraulic distributing unit, which supplies oil pressure to the various welding cylinders, in succession. It is possible to operate two, or even more, cylinders at a time, provided conditions are favorable.

Series Welding

In many instances, series welding proves advantageous. With this method, the welding die has a short-circuit bar and two welding guns, which operate at the same time, and are of opposite electrical polarity, as illustrated schematically in Fig. 1. Series welding is applicable wherever it is possible to place the two guns far enough apart to avoid cross current in the upper sheet. If the upper sheet consists of two individual pieces, as shown, no cross current is possible. This condition is ideal for series welding.

Fig. 2 shows a Hydromatic welder in which series welding is typically applied. Two fixtures, *A* and *B*, are used, and these are electrically connected by an air-operated cross member *C*. All the welding guns work-

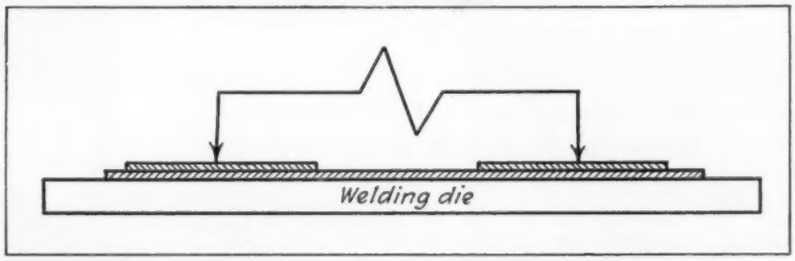
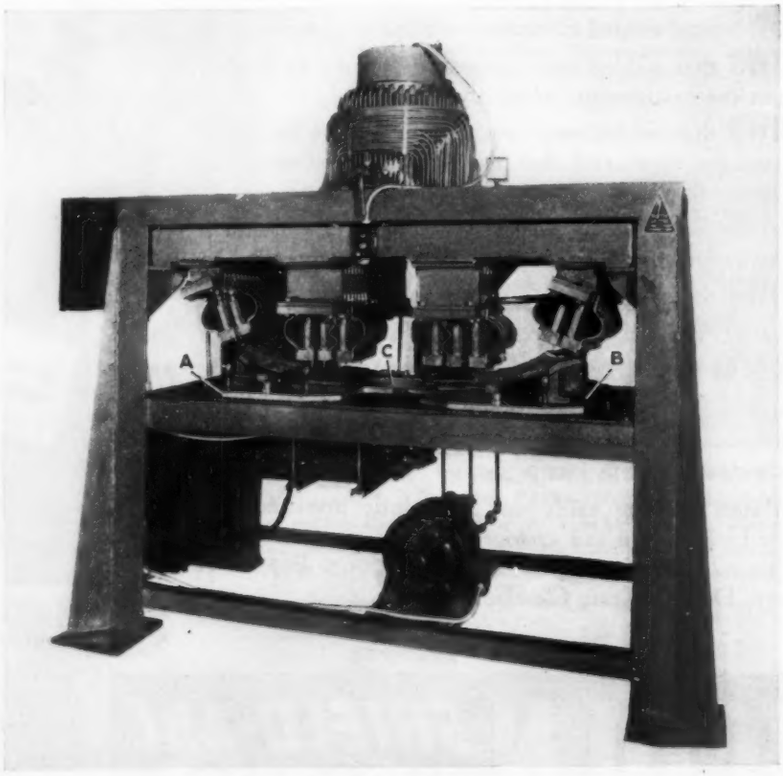


Fig. 1—In series welding, the two guns operate at the same time and are of opposite polarity. The welding die has a short-circuit bar

Fig. 2—Fixtures in this Hydromatic welder are arranged for series welding of comparatively small sheet-metal assemblies, and the fixtures are removed for unloading and reloading



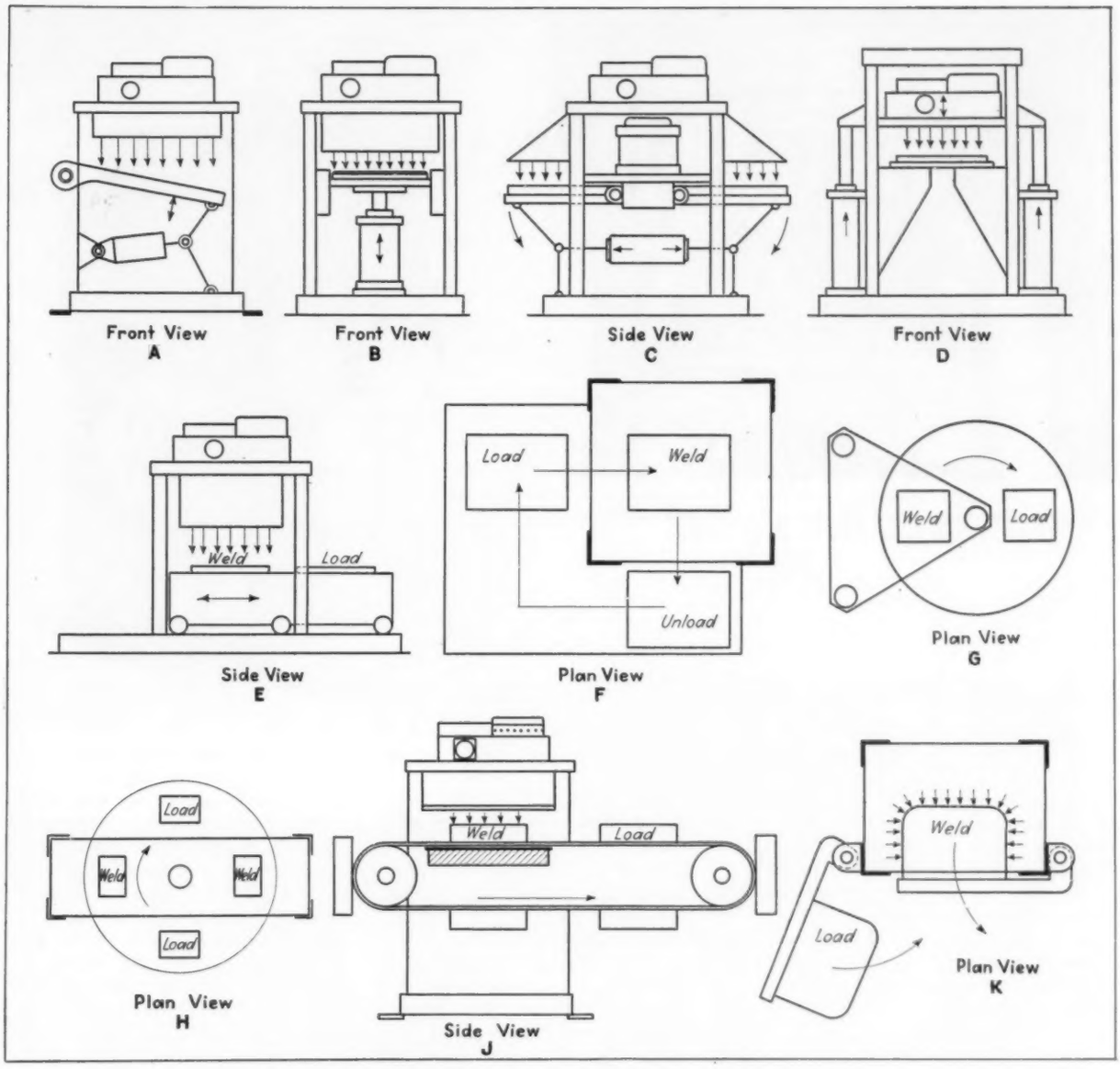


Fig. 3—Hinged, elevating and swinging tables, as well as conveyors, can be used to place the fixture or fixtures under the welding guns

ing with the left-hand fixture are connected to one polarity of the welding transformer, while the welding guns working with the right-hand fixture are connected to the opposite polarity of the transformer. The two fixtures with the cross bar thus form a cross connection. After the welding cycle is completed, the center bar *C* is raised by an air cylinder. This permits the operator to slide the fixtures out of the machine, and to replace them by another pair of fixtures which have been loaded in the meantime.

Loading and unloading is a very important item in Hydromatic welding. It is necessary to analyze the conditions, in order to determine the design of the welder for certain applications. For this purpose, the complete cycle should be divided in two parts: the actual welding time, and the time for loading and unloading. If the production is not extremely large, the operator may wait until the welding cycle is over, then unload and reload the machine. In this instance, the operator is idle during the welding cycle, unless he operates two machines at the same time, using the welding cycle of one machine to reload the second machine, and vice versa. If the production is high, it is advisable to provide means to use the welding time for loading another set of fixtures. This is possible in various ways.

Examples *A* to *K*, Fig. 3, show schematically the various possibilities of designing Hydromatic fixtures for average applications. In order to make loading and unloading possible, it is necessary either to withdraw the complete set of welding guns from the panels, or to move the welding dies with the panels in relation to the welding guns. At *A*, *B* and *C*, the welding dies are withdrawn from the welding guns, either by a hinged table, or by a straight vertical movement of the welding table. In *A* a single table is used, which is hinged at the rear end, operated by an air cylinder through a toggle arrangement. A machine of this type is shown in Fig. 4. At *C*, is a fixture with two hinged tables, which permits the welding of the left-hand

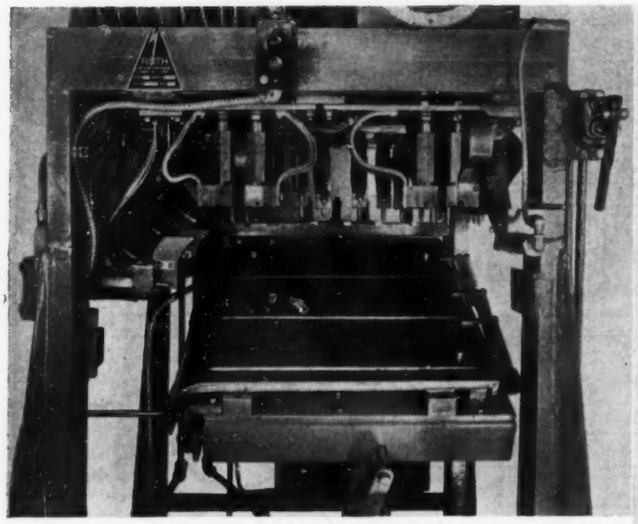


Fig. 4—The hinged table is shown in the lower position. Toggle is actuated by an air cylinder

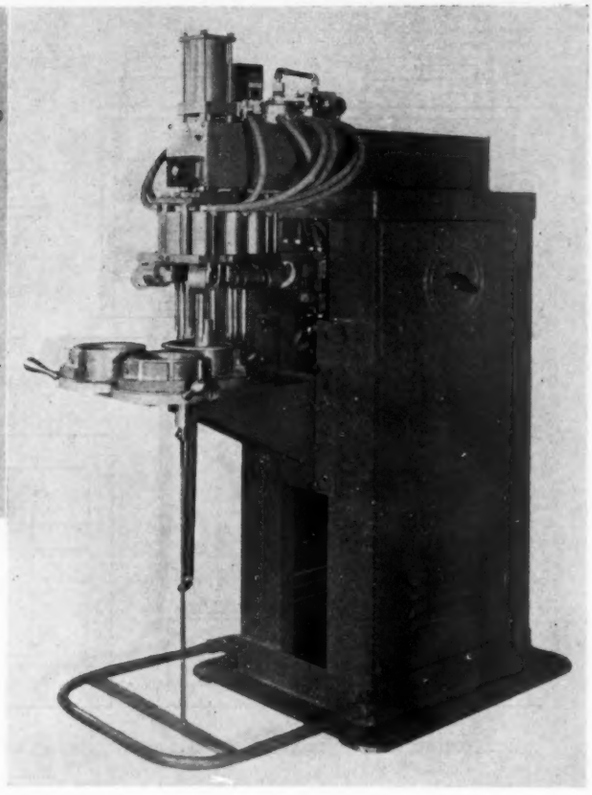


Fig. 5—A turntable carrying three fixtures allows high-speed production of small assembles having twelve to eighteen spots each

and right-hand panel at the same time. In this instance, the conditions are ideal for series welding. While the welding guns on one side of the machine are connected to one pole of the welding transformer, the guns of the other side of the machine are connected to the opposite pole of the transformer. The two welding tables are cross connected by flexible leads.

Example *D* illustrates a fixture with a stationary welding die, whereby the welding guns are mounted on a movable carriage, which is operated by air cylinders in a vertical direction, in order to clear the table for loading and unloading. The welding transformer and the hydraulic distributing unit are also installed on the movable carriage.

Examples *E* to *K* illustrate various designs using multiple fixtures, permitting the operator to reload the machine during the welding cycle. Design *E* shows a carriage on which two fixtures are mounted. While one fixture is in welding position, the other is outside the machine, reloaded. This design, however, makes it necessary for the operator to move from one side of the machine to the other, in order to follow the fixture. Example *G* shows a turn table arrangement, which generally is more efficient. In this instance, the operator can load one fixture, which is outside of the machine, while the other fixture is in welding position. The table rotates 180 deg. after the welding cycle is completed, and the operator does not need to move. A similar arrangement is shown in example *H*. Here, two operators are necessary, one on each side of the machine. For this reason, four, or eventually more, fixtures may be mounted on the turn table; two welding stations are provided. This condition is also ideal for series welding; the table is used as a cross connection for the welding current.

Fixtures Moved by Hand

Example *F* shows an arrangement whereby the welding fixtures are moved on a table. Three or more fixtures may be used, one in the welding position, one for unloading, and one for loading. This arrangement, however, is practical only where the welding fixtures are not too heavy to be moved by hand.

Example *J* shows a welding machine using the conveyor system which is also practical for smaller jobs. At *K*, Fig. 3 is a plan view of an arrangement using two vertically hinged tables, swinging in and out of the machine, for welding and loading. This design, however, calls for a rigid hinge and is only suitable where the fixture is not too heavy.

Fig. 5 illustrates a Hydromatic welder with a turn table arrangement, using three fixtures: one for welding, one for unloading, one for loading. This machine is a Hydromatic application for small parts, where only twelve to eighteen spot welds are required. It eliminates repeated handling of the same part by several operators, and the use of several clamping and locating fixtures. Large savings have been experienced over previous methods.

Application of Hydromatic welding is limited to certain metal thicknesses, depending upon individual conditions. In automotive body welding, 18- and 16-gage sheet metal has been successfully welded. If large panels of 16-gage must be welded, it is of importance to use sufficient pressure to assure perfect contact between the sheet metal and the welding dies. In some instances, it is helpful to use single projections, where heavier parts must be welded to 16- or 18-gage panels. If parts of various thicknesses must be welded in one machine, it is necessary to vary the welding time accordingly. This is possible without difficulty by the application of multi-timing relays connected to the distributing valve, thus automatically changing the welding time, wherever necessary.

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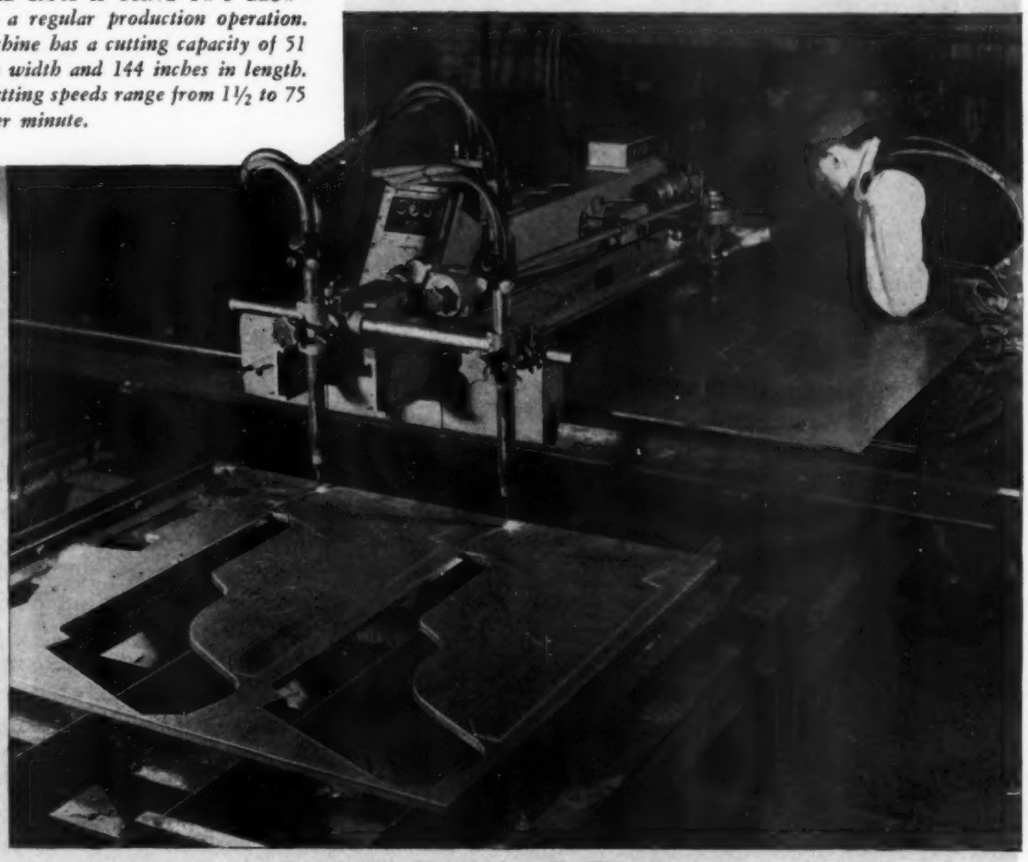
HERE THE CM-12 IS USING TWO BLOWPIPES in a regular production operation. This machine has a cutting capacity of 51 inches in width and 144 inches in length. Lineal cutting speeds range from 1½ to 75 inches per minute.



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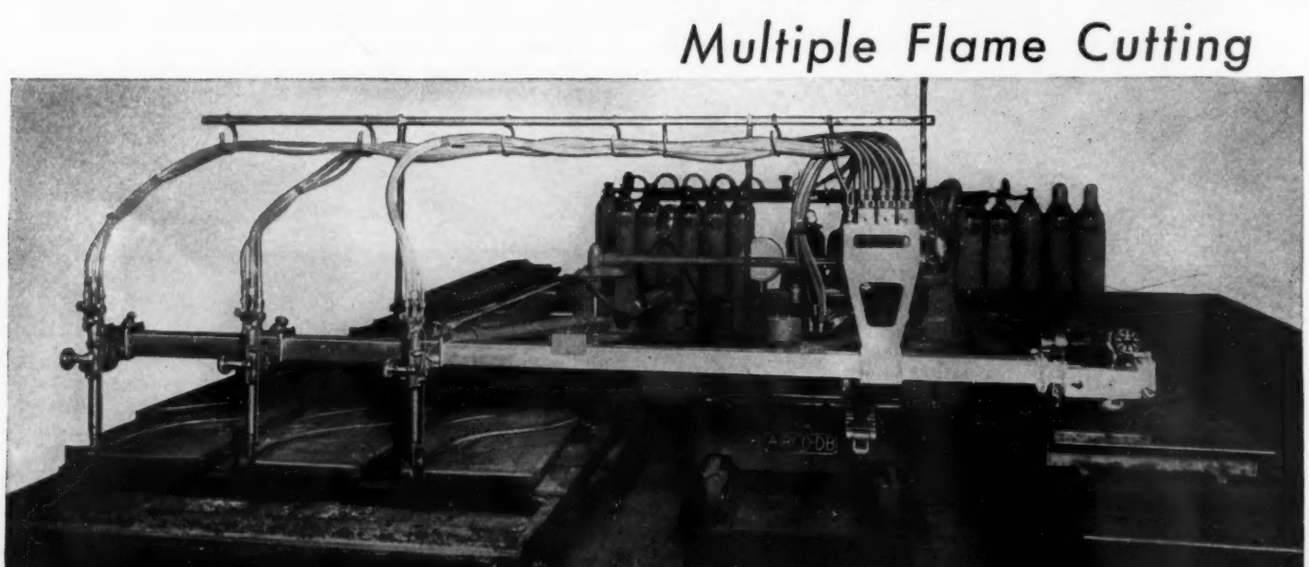

These new AIRCO-DB gas cutting machines will cut steel accurately and economically over a cutting area of 120 inches wide by 13 feet long. The length can be increased indefinitely by the use of additional track. A mechanically operated magnetic tracer —*an exclusive AIRCO feature*—guides the bar upon which the torches are mounted, cutting duplicate parts with speed and accuracy. Other guiding devices for template or manual operation can also be supplied.

As with the AIRCO-DB No. 6 Oxygraph, these machines make multiple torch cutting a *practical* operation.

Another triumph for AIRCO engineering skill—another opportunity to reduce costs in production of parts gas cut from steel.

Be sure to visit the AIRCO exhibit at Atlantic City where these and other AIRCO-DB gas cutting machines will be operating on standard production work.

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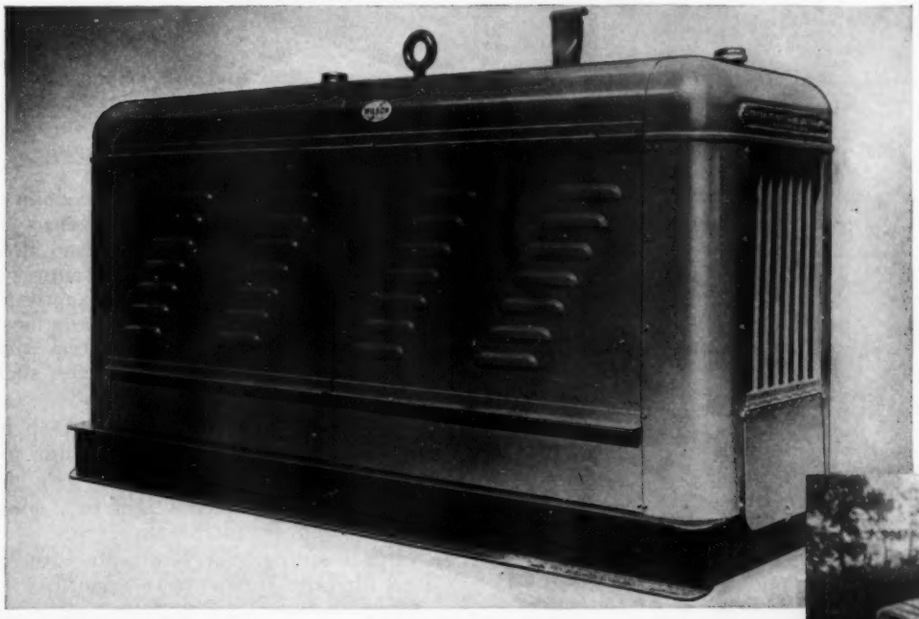

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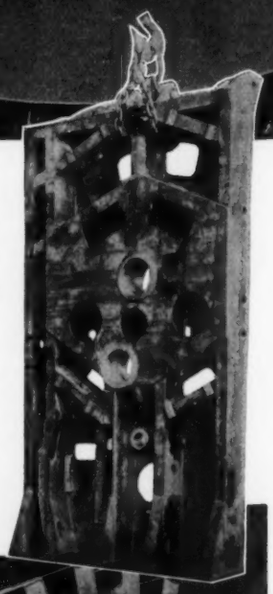

This shovel bed frame, welded from beam sections and rolled steel plates, is part of an all-welded dragline shovel handling a 2½ cu. yd. shovel on an 80 ft. boom. On such equipment, good engineering design has reduced weight without sacrificing strength.

Easily built, long-wearing, welded Rolled Steel sand wheel made of U·S·S Abrasion Resisting Steel, outlasts other higher priced materials.

ROLLED STEEL construction offers a new freedom in design—a faster, more economical method of construction. But even more important, it places at the disposal of the designer and fabricator the entire range of metallurgy's special steels. Permits you to pick these steels to exactly fit each job—to place these steels where they will do the most good. Makes it possible to combine one special steel with another. Or to combine them with castings whenever such combinations seem desirable.

When you design for rolled steel construction, keep in mind the special steels we offer—and what they will do for you. For example—

—to carry high unit stresses and reduce weight to a minimum, there are U·S·S High Tensile Steels.

—to provide high impact strength at low temperatures, there is U·S·S Steel for Low Temperature Service.

—to reduce abrasive wear and cut down replacements, there is U·S·S Abrasion-Resisting Steel.

—to endure temperatures disastrous to other metals, there is U·S·S Heat-Resisting Steel (25-12).

—to carry bearing pressures safely, there are several special analyses of U·S·S Carilloy Alloy Steels.

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UNITED STATES STEEL

Economical Press Tools Through Welding

Simple steel shapes can be built up in a variety of ways, and cold-rolled steel can be used for much of the job

KENNETH BRAINERD
Superintendent, Brainerd Manufacturing Company

TIME AND material can be saved by building-up die parts by arc welding. Time is saved as compared with preparing tool steel, laying out and inserting punches in cold-rolled plates. By using cold-rolled blocks to form spaces for pressure pads, sinking into the shoe is avoided. Built-up bases or sections save costly tool steel, because much of the structure can frequently be made of cold-rolled stock. So for designing dies utilizing arc welding keep handy a reference list of ground or hardening stock in standard sizes and also a list of cold-rolled steel in standard sizes.

In fabricating the forming punch, Fig. 1, part *A* was made of cold-rolled steel, and annealed to prevent warping during welding. Scale was removed. Punch *B* was held securely to plate *A* by means of a clamp and welded on the longer sides as at *C*. An extra width on the base of the punch after machining is desirable. The welded assembly was then hardened and tempered.

This method is also satisfactory for irregular shaped punches. No attempt should be made to apply the principle to small perforating punches made from drill rod because of their size, time required for welding and the time required for replacement through breakage.

Sections using cold-rolled steel merely for securing greater thickness or height of the tool steel working edge can be welded at the junction of the tool steel and the cold-rolled steel parts. An example is shown at *A*, Fig. 2. The welded block was held to the die shoe by bolts and dowels, the bolts being screwed into the cold-rolled portion only.

Another example of composite construction is shown in Fig. 3. The cold-rolled block provides a working surface where the punch passes beyond the die plate in a cutting-off operation. A deep bevel was made in the cold-rolled plate at the junction of the two metals, and filled in by arc welding. The weld was ground flush and all working surfaces were ground to size after hardening and tempering.

A built-up section to receive a pressure pad that must bottom is shown in Fig. 4. Four pieces, *A*, *B*, *C*, and *D* form a nest, and they are welded together and to the cold-rolled part *F*. File notches *G* are made in the top inner corners of the nest to permit spot welding the four pieces together after they are clamped in position. The entire outside edge of the assembly is not welded as shown at *K*.

Welded tools were of small dimensions, the working surfaces being usually 4x5 in. Hardening and tempering were done after welding without ill effects such as warpage or parting. Small-diameter rods prevented over-heating, and the cutting edges and depressions were protected with moistened sheet asbestos.

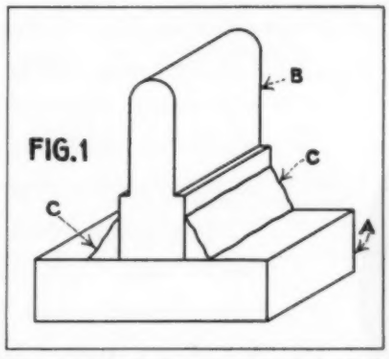

Fig. 1—Welding is a quick method of assembling a sturdy punch to the plate

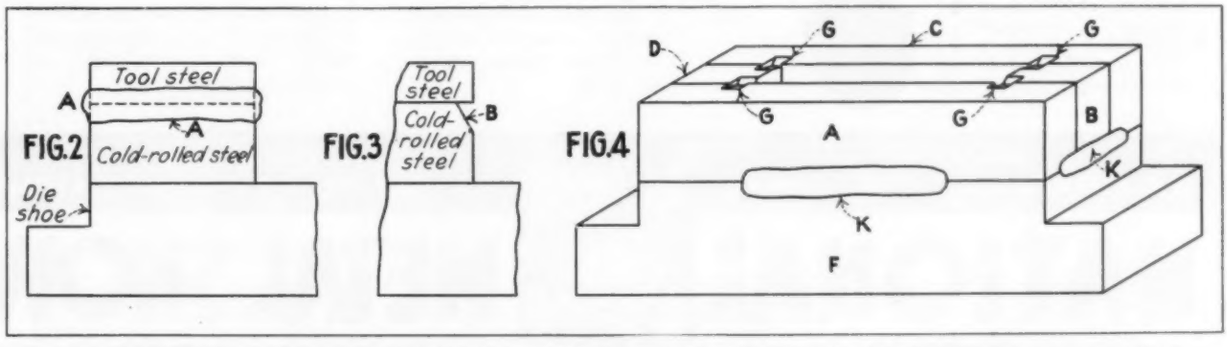

Fig. 2—Dowels and screws are needed only to hold the composite block to the die shoe. Fig. 3—A cold-rolled wearing block was beveled at *B* and welded to the tool steel cut-off die. Fig. 4—Blocks form a nest for a bottoming pressure plate, and they save sinking an opening

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Standard Weld Filler Metal

TENTATIVE specifications, subject to annual revision, have been issued for iron and steel filler metal (arc-welding electrodes and gas-welding rods). Prepared jointly by the American Welding Society and The American Society for Testing Materials, these specifications bear the Serial Designation A205-37T, and an abstract follows:

Scope. These specifications cover arc-welding electrodes and gas-welding rods for the welding of carbon-steel shapes, plates, bars, pipe, forgings, castings and other steel products covered by the American Society for Testing Materials' specifications for material suitable for welding.

The general purpose for which the filler metal is to be used shall be plainly stated in the purchase order. The statement of purpose shall include information as to the position of welding, such as flat or downhand, vertical, overhead, horizontal fillet, etc., also the welding process, such as gas, direct-current arc, alternating-current arc, or other process which the purchaser intends to use.

Seven grades of filler metal are included, designated as Grades 2, 4, 10, 15, 20, 30, and 40, and classified in accordance with the tensile properties of the weld produced by the filler metal, as specified in Table I.

Additional requirements (not given) of an optional nature are provided for use when the purchaser desires to test filler metal in the more complete manner indicated, such as when existing code requirements must be satisfied, or the particular application justifies the expense of the additional testing.

Process. The filler metal may be made by any process that will fulfill the requirements of these specifications.

Standard Sizes. Standard sizes of filler metal are as follows: $\frac{1}{16}$, $\frac{3}{32}$, $\frac{1}{8}$, $\frac{5}{32}$, $\frac{3}{16}$, $\frac{7}{32}$, $\frac{1}{4}$, $\frac{5}{16}$, and $\frac{3}{8}$ in. in diameter. In the case of coated or covered filler metal, the standard sizes refer to the diameter of the core wire. For manual welding, standard lengths for electrodes are 14 and 18 in.; for rods, 36 in.

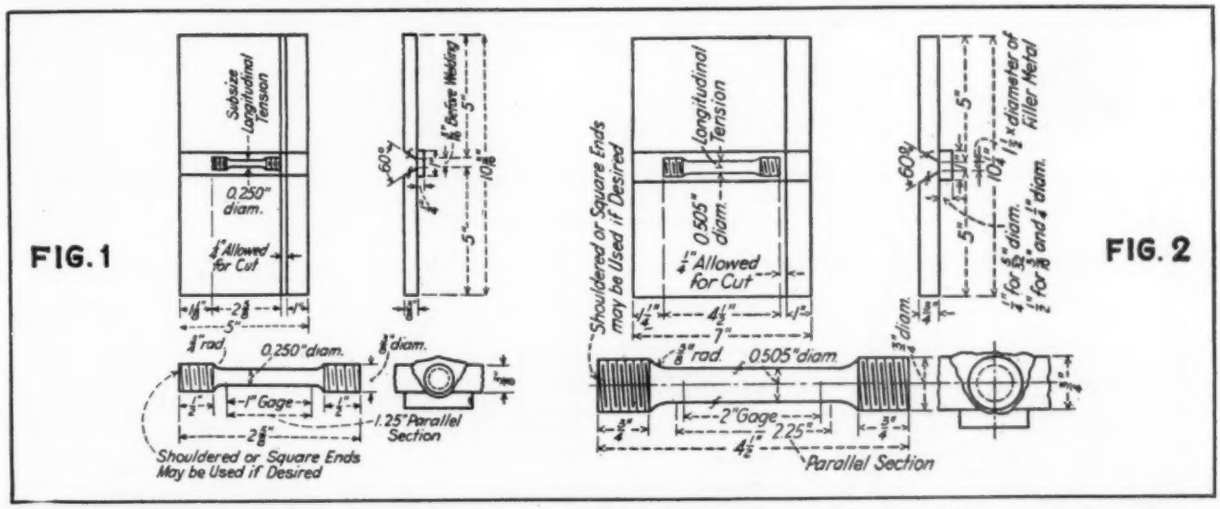
Chemical Composition. The filler metal shall be capable of depositing metal conforming to the following requirements as to chemical composition:

Phosphorus, max., per cent	0.04
Sulfur, max., per cent	0.04

Chemical Analysis. For arc-welding electrodes, the sample for analysis shall be prepared as follows: A specimen of standard base metal (see Table I) of sufficient size, shall be prepared, and a pad of five superimposed layers of arc metal deposited thereon. The fifth or top layer shall be ground or machined away and discarded. The fourth layer shall be carefully milled off and used for the analysis specified.

For gas-welding rods, the sample for analysis may be prepared as described above, except that three layers shall be considered sufficient and the top layer used for the analysis, or analysis may be made of the welding rod. In the latter case, ten rods shall be selected at random from the lot, and milled in such manner as to represent the entire cross-section.

Fig. 1—Test plate for $\frac{1}{8}$-in. diameter filler metal and method of machining specimen. Fig. 2—Test plate for filler metal 5/32 in. in diameter and larger and method of machining specimen



NOTE 1.—The plate shall be used for $\frac{1}{8}$-in. filler metal.
NOTE 2.—Welds shall be deposited in layers or beads.
NOTE 3.—Welds in vertical position shall be deposited upwards.
NOTE 4.—Electric welds shall cool to at least 100 F. between the deposition of each layer or bead.

NOTE 1.—The above plate shall be used for filler metal $\frac{5}{32}$ in. in diameter and larger.
NOTE 2.—Welds shall be deposited in either layers or beads.
NOTE 3.—Welds in vertical position shall be deposited upwards.
NOTE 4.—Electric welds shall cool to at least 100 F. between the deposition of each layer or bead.

Standard Weld Filler Metal

All-Weld-Metal Tension Tests. The deposited metal shall conform to the minimum tensile properties, Table I.

Test Specimens. From each lot of 50,000 lb., or fraction thereof, of each size of filler metal submitted for inspection, a sufficient number of electrodes or welding rods shall be selected at random from various bundles or containers, and a deposited metal specimen prepared.

The specimen shall be prepared in the position specified in the order. If more than one position is specified, a test specimen shall be prepared in each position specified. The welding process (gas, alternating-current arc, direct-current arc, etc.) specified in the order shall be used. The welding shall be performed by a qualified welding operator, following the technique recommended by the manufacturer of the filler metal.

For $\frac{1}{16}$ and $\frac{3}{32}$-in. filler metal, the all-weld tension test is impracticable and the strength of these sizes shall either be judged by the strength of $\frac{1}{8}$-in. or larger filler metal.

For $\frac{1}{8}$-in. filler metal, a plate $\frac{3}{8}$ in. in thickness shall be prepared as illustrated in Fig. 1 and the subsize all-weld tension specimen prepared as shown.

For $\frac{5}{32}$-in. and larger sizes of filler metal, a plate $\frac{3}{4}$ in. in thickness shall be prepared as illustrated in Fig. 2 and the tension specimen prepared as shown.

Test plates shall be so supported that warping due to welding shall not throw the finished test plate out of line by an angle of over 5 deg. If plates are warped, they shall be straightened cold before being stress-relieved where required.

The length of test plates may be increased as desired in order to provide material for additional tests when specified.

Electrodes for Manual Welding. In the case of coated or covered electrodes for manual welding, about 1 in. of the electrode shall be bare or free from coating at the one end for making contact with the holder. The arc end shall be sufficiently bare to permit easy striking of the arc, but the length of the bare portion of the arc end, measured from the end to the point where the full cross-section of the coating obtains, shall not exceed one diameter.

Permissible Variations in Dimensions. Cross-sectional dimensions shall not vary from that specified by more than $\pm$ 3 per cent.

Cut lengths shall not vary from that specified by more than $\pm \frac{1}{8}$ in.

Workmanship. Uncoated filler metal and the core of coated or covered filler metal shall be of uniform quality free from injurious segregation, oxides, pipe, seams or other irregularities.

On coated or covered filler metal, the coatings and coverings shall be such that they are not readily damaged by ordinary handling and shall be of commercially uniform thickness and shall present a workmanlike appearance. Coatings and coverings shall be free from injurious scabs, blisters, abnormal pockmarks, or bruises.

Finish. The surface of gas-welding rods and bare electrodes shall be smooth and free from harmful scale, oil, or grease and shall be plain or copper finished, as specified.

Packing. Filler metal shall be suitably packed, wrapped, boxed or crated to insure against injury during shipment or storage, as follows:

Bundles of 50 or 100-net weight.

Boxes or kegs of 50, 100, 200, or 300-lb. net weight, and

Coils or reels of approximately 50, 100, 150, 200, or 300-lb. net weight.

Markings. All bundles, boxes, kegs, coils or reels shall be legibly marked with this information:

(*a*) Grade,

(*b*) Manufacturer's name and trade designation,

(*c*) Purchase order number,

(*d*) Size of filler metal, and

(*e*) Net weight.

TABLE I.—TENSILE REQUIREMENTS FOR DEPOSITED METAL.

Grade	Base Metal	Treatment of Welded Specimen[c]	All-Weld Tension Test	
			Tensile Strength, min., lb. per sq. in.	Elongation in 2 in., min., per cent
No. 2	A.S.T.M. A 70 Firebox quality steel plate,[a] tensile strength 55,000 lb. per sq. in., min.; or A.S.T.M. A 7 Steel for bridges,[b] tensile strength 60,000 lb. per sq. in., min., with carbon not over 0.25 per cent and manganese not over 1.00 per cent; or equivalent steels.	stress-relieved	80 000	20[d]
		non-stress-relieved	80 000	15[d]
No. 4	same as for Grade No. 2	stress-relieved	75 000	20[d]
		non-stress-relieved	75 000	15[d]
No. 10	same as for Grade No. 2	stress-relieved	60 000	25
		non-stress-relieved	60 000	20
No. 15	same as for Grade No. 2	stress-relieved	60 000	20
		non-stress-relieved	60 000	17
No. 20	same as for Grade No. 2	stress-relieved	52 000	10
		non-stress-relieved	55 000	7
No. 30	same as for Grade No. 2	stress-relieved	45 000	7
		non-stress-relieved	47 000	5
No. 40	same as for Grade No. 2	stress-relieved	45 000	5
		non-stress-relieved	47 000	3

[a] See Standard Specifications for Carbon-Steel Plates for Stationary Boilers and Other Pressure Vessels (A.S.T.M. Designation: A 70) of the American Society for Testing Materials, 1936 Book of A.S.T.M. Standards, Part I, p. 56.

[b] See Standard Specifications for Steel for Bridges (A.S.T.M. Designation: A 7) of the American Society for Testing Materials, 1936 Book of A.S.T.M. Standards, Part I, p. 1.

[c] Stress-relieving where called for in these specifications is for the purpose of developing the fundamental properties of the weld metal unaltered by locked-up stress. Values obtained from stress-relieved welded specimens are about 5 per cent lower in tensile strength and 10 to 20 per cent higher in ductility than those of non-stress-relieved specimens. The fact that a filler metal test requires stress-relief signifies only that it must develop the strength required regardless of stress-relief, and not that stress-relief must always be used in actual work. Stress-relieving shall be within the range of 1100 to 1200 F. for 1 hr. per 1 in. of thickness. Gas-welded specimens may be heat-treated at higher temperatures than the temperature specified above for stress-relief.

[d] It is immaterial how these high physical properties are obtained, that is, whether by carbon-steel filler metal with manganese and silicon contents or by the use of some other alloying elements, but the total amount of such other elements shall be less than 4 per cent.

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Martins' Air operated Welding Guns can be adapted to practically any shape or location, an unlimited variety of yoke and scissor action jaws can be fitted which will reach any spot which is possible to get into.

The counter weight balancer can be adjusted to any operating position, and is of sufficient capacity for the easiest and quickest handling of the gun at the work.

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The Martin Push Type indirect Welding Tool is one of the handiest resistance welding tools on the market today. Priced for the small shop yet efficient for production line speed.

FEATURES

The transformer is very simple and rugged in construction, it is small and compact and very efficient.
The secondary is water cooled by a continuous copper tube running through the secondary casting, instead of the conventional steel tube that clogs with rust.
The primary winding is insulated throughout with asbestos, and four leads are brought out through the connection plate, so that it may be used on either 220 or 440 volts.
Welding cables 400.000 C.M. hollow interlocking core, rubber covered, water cooled.
The conventional weld heat or voltage adjusting switch is eliminated, thereby eliminating another source of trouble.
This change in weld heat is made by moving the gun cable to different secondary terminals until the proper average is determined, and all adjustments may be made with the automatic timer, after the proper gun terminal has been selected.

• • • • •

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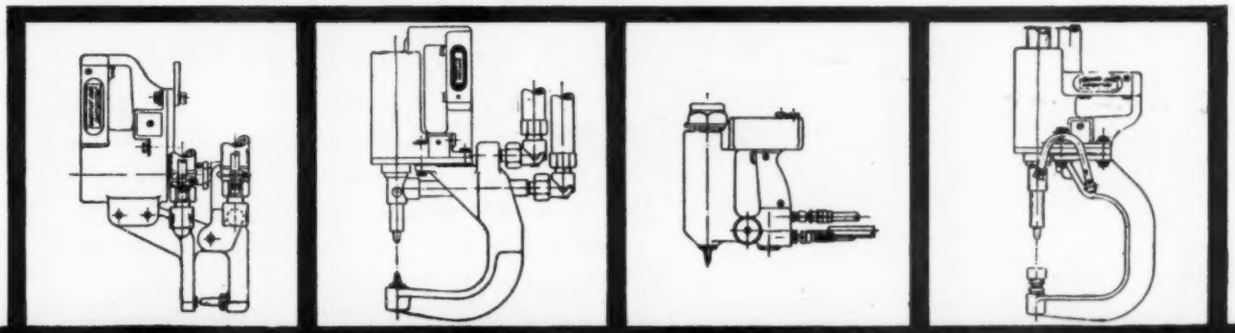

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Mechanized Flame Cutting

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Secretary, International Acetylene Association

The ability of the oxy-acetylene cutting blowpipe to cut through practically any thickness of steel is familiar to everyone interested in metals or metal products. The mechanization of the cutting blowpipe, however, so that parts are flame-cut automatically is a development of recent years. Machine shops employing flame-cutting machines have been able to increase production without increasing existing production facilities. Furthermore, reduction of finished inventories and elimination of the risk of obsolete parts is possible because the flexibility of the flame-cutting machine has made "special order" manufacture practically as economical as "quantity" manufacture.

Automatic shape-cutting machines are driven by small electric motors. Whether guided by hand or following a templet, the machine moves the cutting blowpipe at the desired speed and a smooth and accurate cut results. Shape-cutting machines assume different forms and types, depending upon the work to be done. There is a machine to perform every type of cutting job, regular or irregular, from light plate to heavy stock.

Turning first to the regular operation of of cutting steel shapes from stock, an important development is the portable cutting machine. This machine is light and can be moved from one job to the next regardless of the location of that job in the shop.

When cutting irregular shapes, this machine is directed by hand, and the degree to which the machine can cut shapes of a simple or complex contour depends upon the skill and experience of the operator. For straight line cuts, the wheels are locked in position, and the machine is guided by an angle bar that serves as a track. The machine is also equipped to cut circular shapes ranging in diameter from a few inches to several feet.

The portable cutting machine has many advantages, particularly on smaller jobs. Routing and transportation of materials is reduced to a minimum, since any desired shape can be cut and no supporting equipment for the machine is necessary.

For larger, heavier jobs, stationary flame-cutting machines are employed. These are so equipped that the motion of the cutting flame is guided similar to this templet indefinitely. For this heavier work, the stock is placed on a supporting framework. The machine moves on tracks adjacent to the supporting framework and has an extension arm holding one or more cutting blowpipes.

Recent developments in stationary shape cutting machines have embodied greater cutting capacity, more power, and greater flexibility and ease of operation than any machines developed so far.

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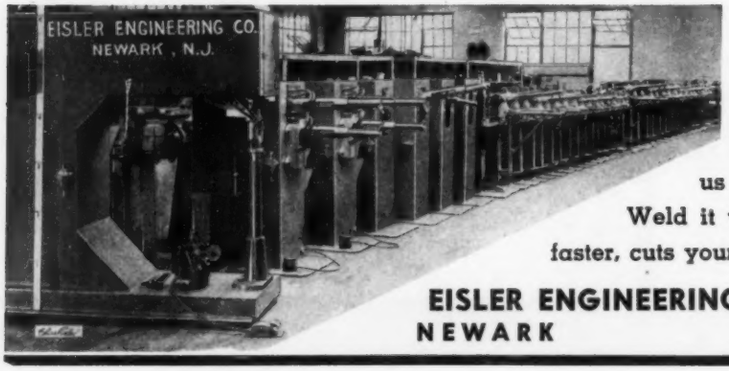

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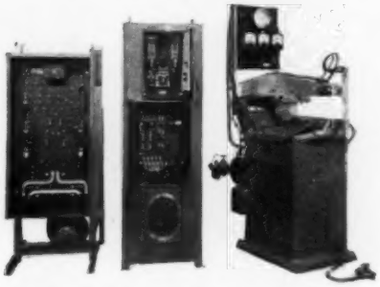

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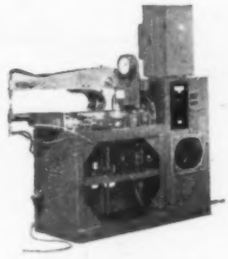

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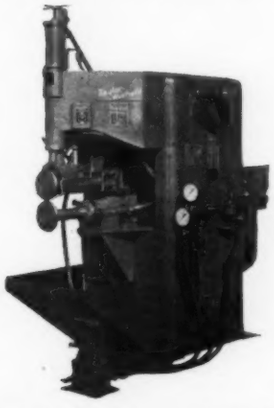

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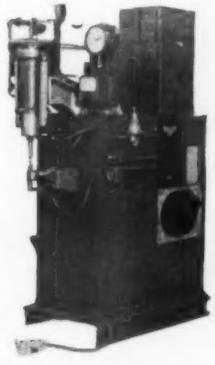

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A new 100 x 410-ft. building houses one of General Motor's largest heat-treating departments

BURNHAM FINNEY
Western Editor American Machinist

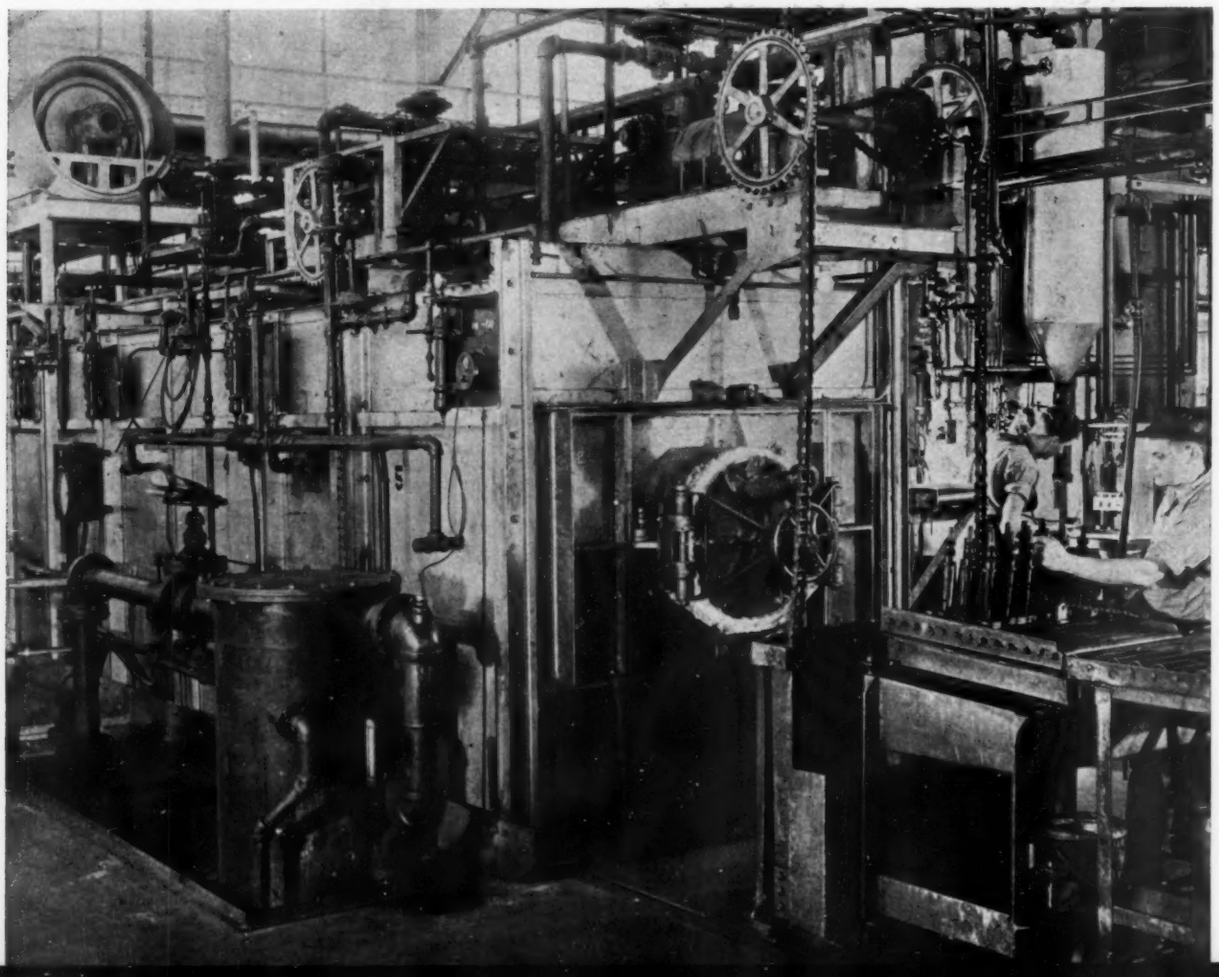
PART of an extensive program of rehabilitation and expansion of manufacturing facilities throughout the various plants of the Buick Motor Company is an enlarged department for heat-treating transmission gears, transmission parts and miscellaneous components for the valve-in-head eight cylinder engine. A new building, erected above and around the old building without interrupting production operations, houses new and rehabilitated equipment selected for each operation.

Five of the nineteen bays of the new building, approximating 10,800 sq.ft. of floor area, are devoted to the hardening of external gears for the new automatic transmission to be available in Series 40 cars. These gears are of S.A.E. 4640, nickel-molybdenum oil-hardening steel.

An overhead, continuous conveyor delivers external transmission gears coming from the machining department to an unloading station conveniently located near the loading end of the hardening furnace. At this station the gears are transferred by roller conveyor to a mechanical washer, where they are cleaned thoroughly in preparation for hardening. After the cleaning operation, gears are racked on trays for delivery to the furnace.

Five heating zones in a Holcroft pusher-type, controlled-atmosphere furnace, Fig. 1, heat the gears to 1,550 F., giving them a case depth of about 0.005 in. during the 80-min. cycle. Each heating zone has a slightly carburizing atmosphere,

Fig. 1—One of the two Holcroft controlled-atmosphere, pusher-type, gas-fired furnaces installed for hardening transmission gears and shafts



which is tested periodically to insure the maintenance of proper conditions. Recording and controlling pyrometers hold the temperature within proper limits. A generator unit provides gas for furnace atmosphere control.

As the trays of gears emerge from the furnace they are carried, automatically, into an oil quenching tank, equipped with a cooler to hold the oil at a correct temperature. An elevator raises the gears from the quenching tank into a second washer, through which they are carried.

The file-hard gears are then dried by air blast, Fig. 2, and are transferred by hand to racks for insertion in a special vertical draw furnace. Here the gears are drawn at 450 F. to a hardness of 50-56 Rockwell C. Upon completion of the drawing operation they are carried by roller conveyor to a group of crank presses, Fig. 3, where clutch gear shafts and main shafts are straightened in special fixtures.

An overhead conveyor carries all transmission gears to specially equipped inspection benches, where they are tested for toughness of teeth, depth of case and hardness. Upon completion of inspection operations, the gears are returned to the machining department by means of a third overhead conveyor.

Fig. 2—Drying gears with air blast prior to hanging them on racks in Buick-designed vertical draw furnace in background

Fig. 3—Heat-treated clutch gear and main shafts for transmission assemblies are straightened in crank presses equipped with special fixtures

Internal Gears

Three internal transmission gears are heat-treated in a group having substantially the same equipment as that set up for external gears, except that three Gleason quenching machines have been substituted for the automatic quenching tank. The pusher-type, controlled-atmosphere furnace in this group is equipped with twin muffles.

Internal gears are transferred from the furnace to the quenching machine dies, Fig. 4, with hand tongs, where quenching is done with minimum distortion. They are then washed, drawn in another special vertical drawing furnace and passed on, by conveyor, to inspection benches.

Oil-pump drive gears, made of S.A.E. 4620 steel, are carburized in a continuous furnace and hardened in another continuous furnace in which a carburizing atmosphere is maintained. This process keeps distortion at a low level and results in a uniformly hardened gear.

Small parts, such as shifter rails, oil pump shafts, reverse gear shafts, clutch studs and various control plungers are carburized in boxes

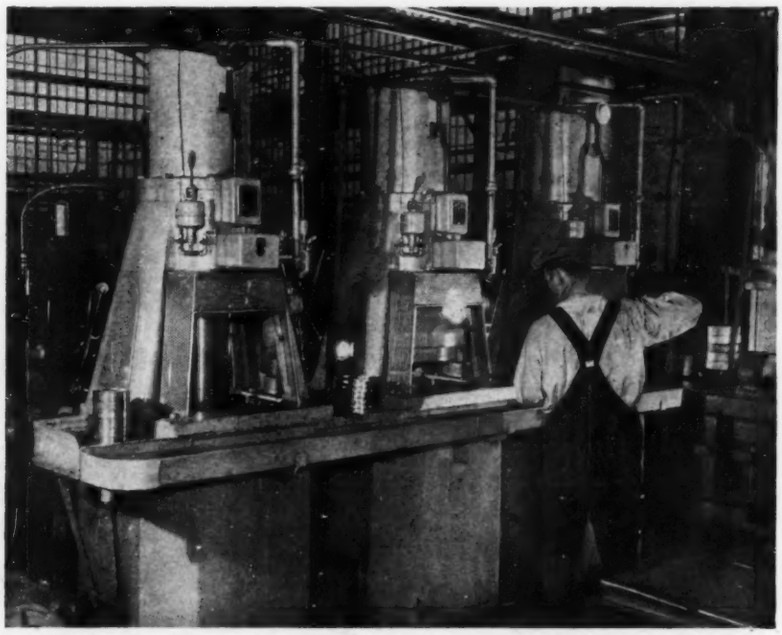


Fig. 4—Internal gears for transmission are quenched in Gleason machines to minimize distortion. Hand tongs are used to transfer the gears

passed through continuous furnaces. Brine and water quenching tanks are provided at the ejection ends of these furnaces. Cyanide baths are provided for hardening a number of small stampings and forgings that go into the automatic transmission unit. Hoists suspended from monorail tracks and ½-ton capacity, 7 to 10-ft. boom, jib cranes service these various units.

Three-Conveyor Furnaces

Various component parts, for both transmission and motor assemblies, are pack-hardened in continuous furnaces, Fig. 5, designed with three separate plate-belt conveyor lines by Buick engineers. Individual drive, provided for each conveyor, makes possible the carburizing of parts to different case depths simultaneously by varying the time required to pass a box through the furnace. Furnace temperature is held automatically to 1,700 F.

Valve rocker-arm shafts are carburized in a small continuous-chain conveyor furnace maintained at 1,430 F. Chain is designed so as to drop away from under the work at the end of the furnace, permitting the work to roll onto a rack for removal through a door in one side of the furnace. The arm shafts are water-quenched between driven rolls which hold them straight.

Nine Rockwell carburizing retorts, Fig. 6, are employed for small parts suitable for this type of furnace. Rapid hardening and uniform carburization are obtained at a furnace temperature of 1,700 F.

Flywheel gear rings and small engine parts are cyanide hardened in a continuous unit, Fig. 7, originally designed for transmission gears and applied later to small parts. This furnace is fired with city gas and the temperature in the cyanide soaking pit is held at 1,500 F. Work is carried in an overhead conveyor which dips it into each unit, then lifts it out and moves it into the next unit.

Work goes through the furnace in six steps: (1) pre-heat, (2) cyanide pre-heat, (3) cyanide soak, (4) oil quench, (5) first wash, (6) second wash. Sectional construction permits replacement of any one of the six units should it fail.

Vertical Draw Furnaces

Custom-built, vertical draw furnace units, previously mentioned, are used successfully in various Buick heat-treating departments. Each of these units is built to suit individual requirements for width, height, conveyor arrangement, zoning, loading and unloading conditions. Design varies, also, with the size and shape of the pieces to be heated, requirements for surface protection, production desired, temperatures to be maintained and the operations preceding or following the heating cycle.

In the vertical furnace loading and unloading is done at one station, with conveyor trays or racks in the open and at a convenient height for handling the work. A steel baffle extends upward and divides the furnace into two "legs", the one on the loading side being the "ascending" leg where the stock is heated. Stock is soaked at an even temperature while passing down through the opposite leg.

Combustion gases, entering the furnace through narrow, longitudinal slots in the two combustion boxes, travel upward against the descending stock, across the top of the furnace and down the other side of the baffle to escape into a hood

Fig. 5—Three, independently-controlled, conveyor lines increase the adaptability of a number of Buick-designed continuous carburizing furnaces

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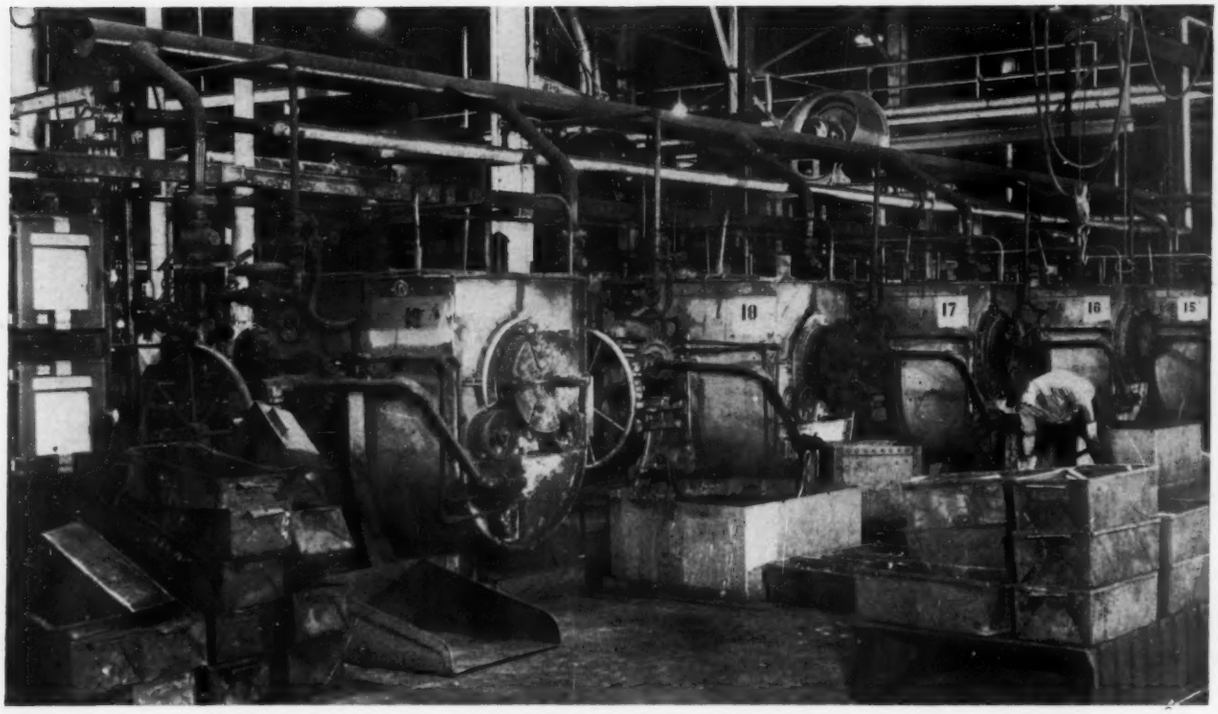


Fig. 6—A battery of Rockwell retorts operate at 1,700 F. to carburize a variety of small parts suitable for this type of furnace

at the loading position. Thus all gas flow is counter to the work being heated and the temperature of the waste products of combustion is relatively low when they pass from the furnace.

Temperature control is obtained by equipping each combustion box with two burners: (1) a small burner that fires continuously and serves to keep the combustion box hot and (2) a larger, thermocouple-controlled burner that is turned on and off as required to maintain the required temperature.

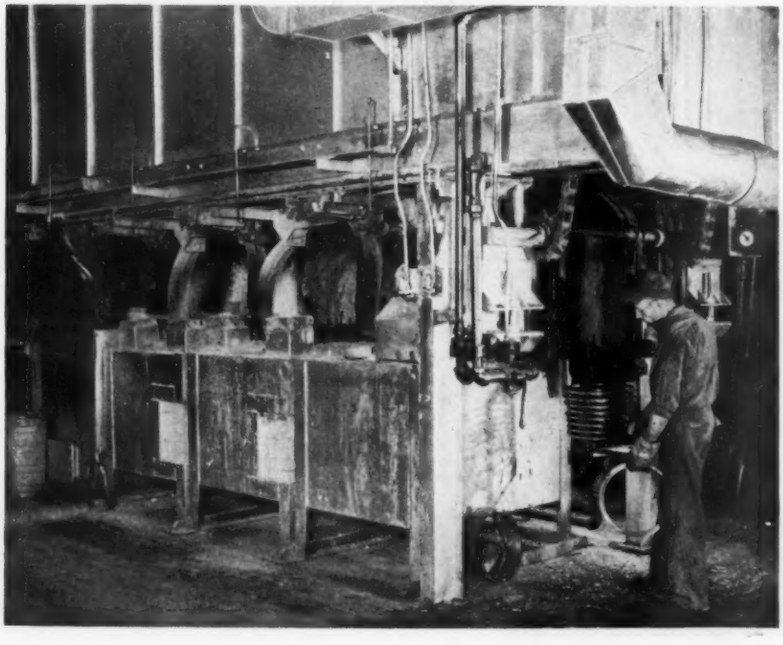
These two comparatively small boxes afford complete combustion for the gas-air mixtures supplied through the burners. Furthermore, they will operate under a considerable back pressure, which is essential since no venting from the top of the furnace shaft is permissible.

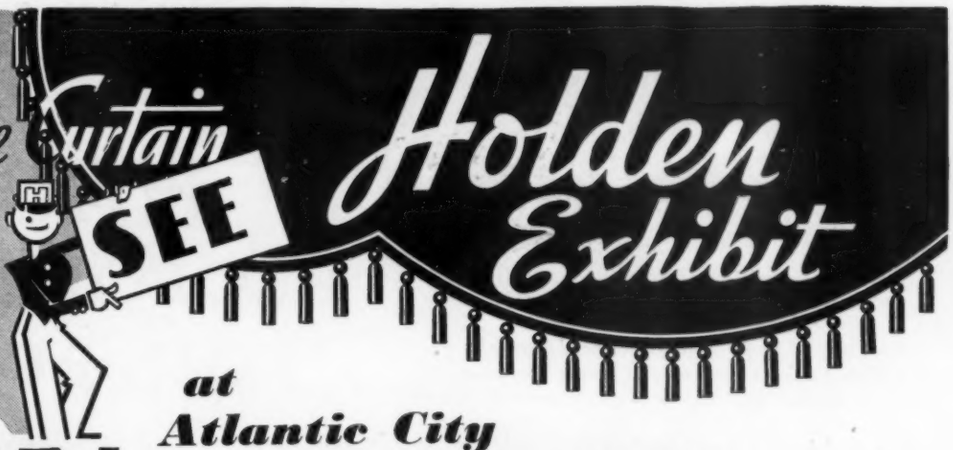
The mechanism of heat transmission is as follows: The insulated shaft, open at the bottom of both legs, affords a pull on the products of combustion only as the cooling gases on the cold side are heavier. This natural flow assures a definite travel of the gases without undue chimney action, or channeling. The hot gases are directed against the baffle in a thin stream across the width of the furnace and, traveling upward, affect the control thermocouple at the top of the stack. Descending gases, in the cold leg, maintain correct travel for uniform heating since the greatest volume of gases will flow through the coldest channels. Compensation for nonuniform loading and radiation is automatic.

For low temperature work the endless conveyor is made of plain carbon steel and is driven through sprockets on the head shaft. The lower, or "foot" shaft floats on the chain loops. Suitable crossbars, for load-carrying fixtures, connect the two strands of continuous chain.

Where vertical headroom is available for such a furnace, large capacities can be installed in a minimum of floor space. Fuel efficiencies are high and continuous operation is possible. Another advantage lies in the convenience for the operator, who, standing in one position, loads and unloads the exposed conveyor easily.

Fig. 7—This furnace, originally arranged for the cyanide hardening of transmission gears, has been adopted for treating flywheel rings and other small parts





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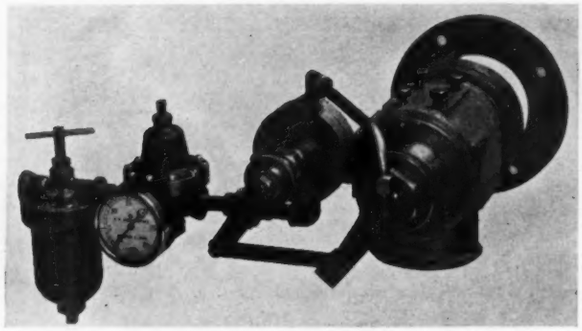

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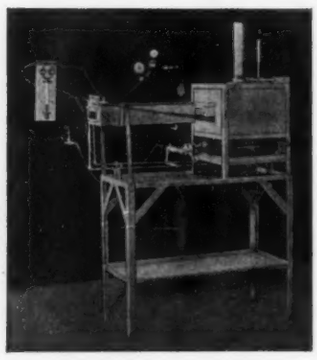
TWO SIZES. No. 11, heating space 6 x 8 inches, height 1½ inches. Height of furnace and stand to base of chimney 49 inches. Furnace occupies 18 x 44 inches of floor space. No. 12 has heating space 8½ x 15 inches, 2½ inches high. The furnace, with stand, measures 51 inches in height to base of chimney and occupies 24 x 60 inches of floor space. No. 11 reaches a temperature of 1500°F in 30 minutes, (Newark City gas 550 B.T.U.), without a blower.



Both types equipped with strong steel stand, Weston pyrometer with long life thermo-couple. Temperature range 1050° to 1850°F. Special sizes built to order.

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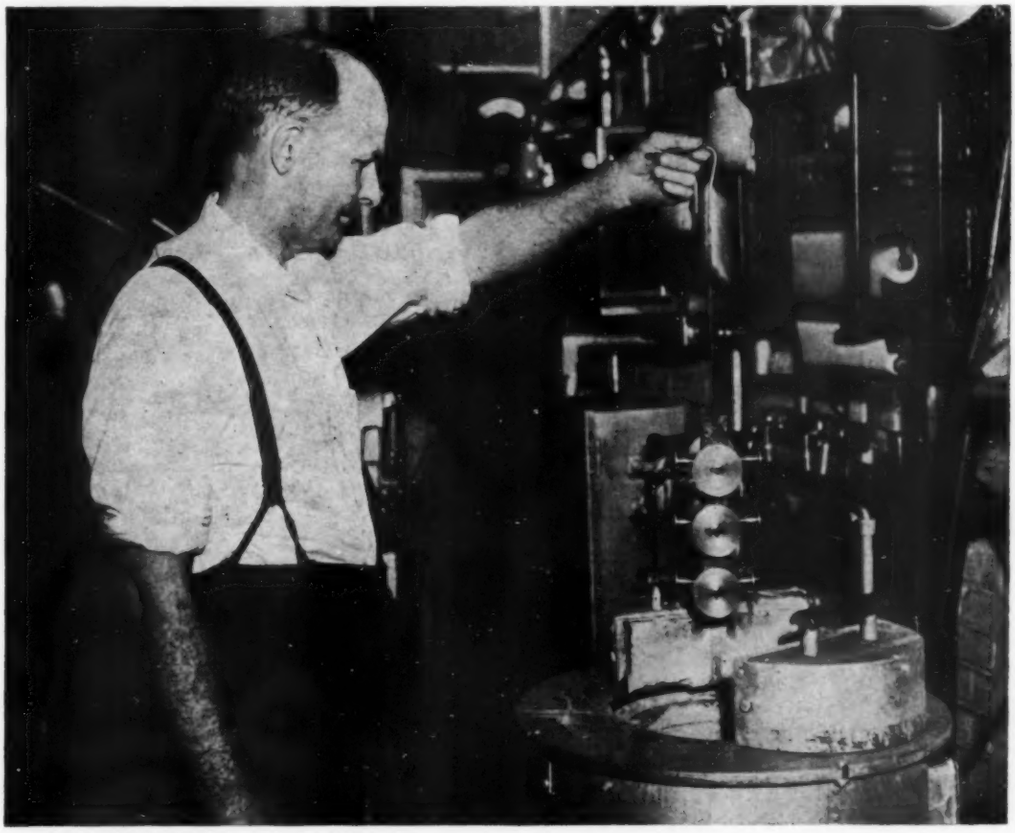
IF what you are looking for is not advertised in this issue, look in your copy of the Annual Review & Catalog Number (January 27, 1937 issue).

AMERICAN MACHINIST
330 West 42nd Street, New York, N. Y.

"Dishing" During Heat-Treatment

Changes in material and method have lessened the breakage of a delicate part and wrought economies in a production department

JOHN W. QUANTIUS, *Toolroom Foreman, Camden Plant, RCA Manufacturing Company, Inc.*

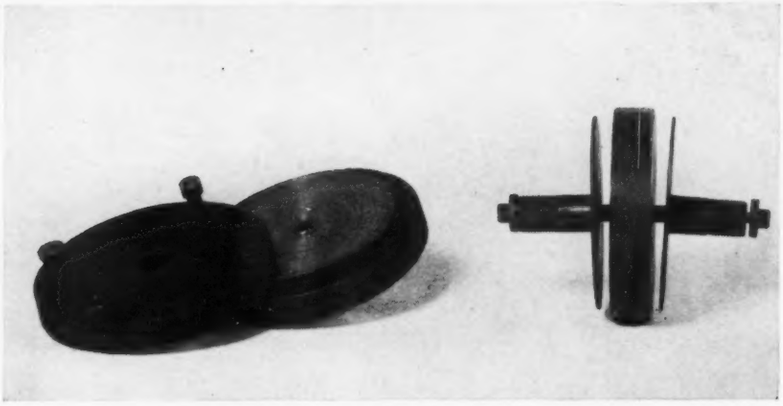


Twelve center plates are hardened at once in a Leeds & Northrup Hump toolroom furnace

WITH 75 breaks per week in the molding room, Camden plant, something had to be done about the center plate for the label cavity of record molds. These plates were being made of high carbon (1.20 C) tool steel and were peened to the required curvature after heat-treatment. This was a costly and unsatisfactory method from the standpoint of uniformity as well as of good service life.

The tool shop went to work on the problem, and first changed the material to S.A.E. 4140, a chrome-molybdenum steel of 0.40 per cent carbon. But the problem of peening remained. This was overcome by designing a new fixture that would set the metal in the center plate to the proper dish or curvature when placed in the tempering furnace. These two changes have cut the cost of the center plates by 50 per cent. In addition, the breakage in the molding room is now only four per week despite the fact that operations have been stepped up one-third.

As received in the toolroom heat-treating department, the center plates have been machined on turret lathes



At the left is the old flat plate fixture that takes only one center plate, and at the right is the new fixture that takes two center plates and requires less handling

from drop forgings. An allowance of 0.007 to 0.010 in. is left for grinding after hardening.

The first step is to rack the center plates twelve at a time and place them in a toolroom-type Hump electric furnace for 55 min. at 1,500 F. They are then removed and quenched in oil maintained at 100 F. A hardness of 54-58 Rockwell C is obtained.

For drawing, the center plates are loaded on fixtures, such as shown. These fixtures take two pieces and the two faces are machined concave with the correct curvature to dish the center plate as required. The fixture consists of a disk about 1 in. thick and 3, 3½ or 4½ in. in diameter to suit the center plates which range in size from 2¾ to 4⅜ in. in diameter. The fixture disk is drilled for a short mandrel that protrudes from both ends and which is the proper diameter to pass through the hollow stub shaft on the center plate. Both ends of the mandrel are drilled and tapped so that a work piece can be fastened at each end by means of a hollow-head capscrew. The radius to which the disk is turned concave is determined by experiment, and the accompanying table gives the radii for the various fixtures. All center plates have approximately 0.010 in. dish.

Size of disk	3 in.	3½-in.	4½ in.
Depth of dish	0.024	0.026	0.035

Besides eliminating the peening operation, the new fixture has other advantages. In the older practice the disk portion of the center plate was clamped between two heavy disks and the assembly fastened with four screws. Present practice consists of putting two pieces on the single fixture and using only one screw per piece for fastening purposes. Besides a considerable saving in handling, the smaller assemblies allow more pieces to be placed in the tempering furnace at once. In the old practice only about 30 pieces would be loaded, whereas with the new method 50 fixtures containing 100 pieces can be tempered at once. There is considerable heat economy also in that the old style fixture with a single part weighed 3¾ lb. whereas the new style fixture with two parts weighs only 1 lb. 10¼ oz.

Cooled in Furnace

Another Leeds & Northrup furnace is used for the tempering operation. The center disks are drawn at 600-625 F. for 4 hr. and cooled in the furnace, cooling taking approximately 12 hr. The final hardness is 42-48 Rockwell C scale. Adoption of a new material and of a new method of producing the center plate has done away with the trouble formerly experienced in the machining and use in the molding room.

Clean-Hardened Pen Points

MORE THAN 20 years ago the Esterbrook Steel Pen Company installed what was perhaps the first reciprocating-hearth furnace used for heat-treating operations. That furnace was designed by a metallurgist familiar with ore concentration as then practiced in the western part of the United States. By using a reciprocating hearth with an impact action on the forward stroke, he was able to propel steel pen points through the hardening operation in short intermittent jumps.

The Esterbrook Company worked with the American Gas Furnace Company to build two of these furnaces. They were in service until recently, when one was replaced by a new A.G.F. hardening machine, and the other retained for standby service.

Modernization of the hardening operation was undertaken for several reasons. The most important is reduction in pen breakage. A considerable percentage of the glass-hard 0.95 C pen points were broken in the subsequent operations of oil slinging, tumbling, handling through alkali washing, rinsing, pickling, neutralizing, rinsing, drying, and drawing. Second, the pickling operation can be eliminated entirely because the pen points now come from the controlled-atmosphere furnace in a clean, bright condition. The other furnaces scaled the work badly because they did not have a closed muffle containing city gas in order to prevent oxidation. Thus, as a third reason for this installation, there is a saving in steel of 30 per cent which was formerly lost to scale.

Two Batches Per Hour

The new hardening machine takes care of the company's present production, which amounts to about 50 lb. per hr. Two batches of 20-25 lb. are put through in that time. Each batch is dumped in a special hopper that drops a measured supply onto the reciprocating hearth. Pen points are evenly distributed both lengthwise and sidewise to give uniform heating as they progress through the furnace. While in the gas-filled muffle they are fully protected from oxidation and when they reach the far end the points fall through a closed chute into the quenching oil.

A constant temperature for the quenching oil is secured by circulation to outside cooling tanks. The oil is returned by gravity to the furnace room, and is discharged in a spray near the point where the pens enter the quench tank.

Controlled-atmosphere heat-treating in this plant will permit the simplification and reduction of subsequent operations in finishing the pen point. Moreover, the efficiency of the new furnace is such that no additional gas is consumed. That taken by the muffle is offset by the lowered heat loss arising from better firebrick and thermal design.

Temperature–Measured and Controlled

Accurate temperature detection, measurement and control is the demand of the metal-working industry today

R. R. WIESE
Assistant Editor

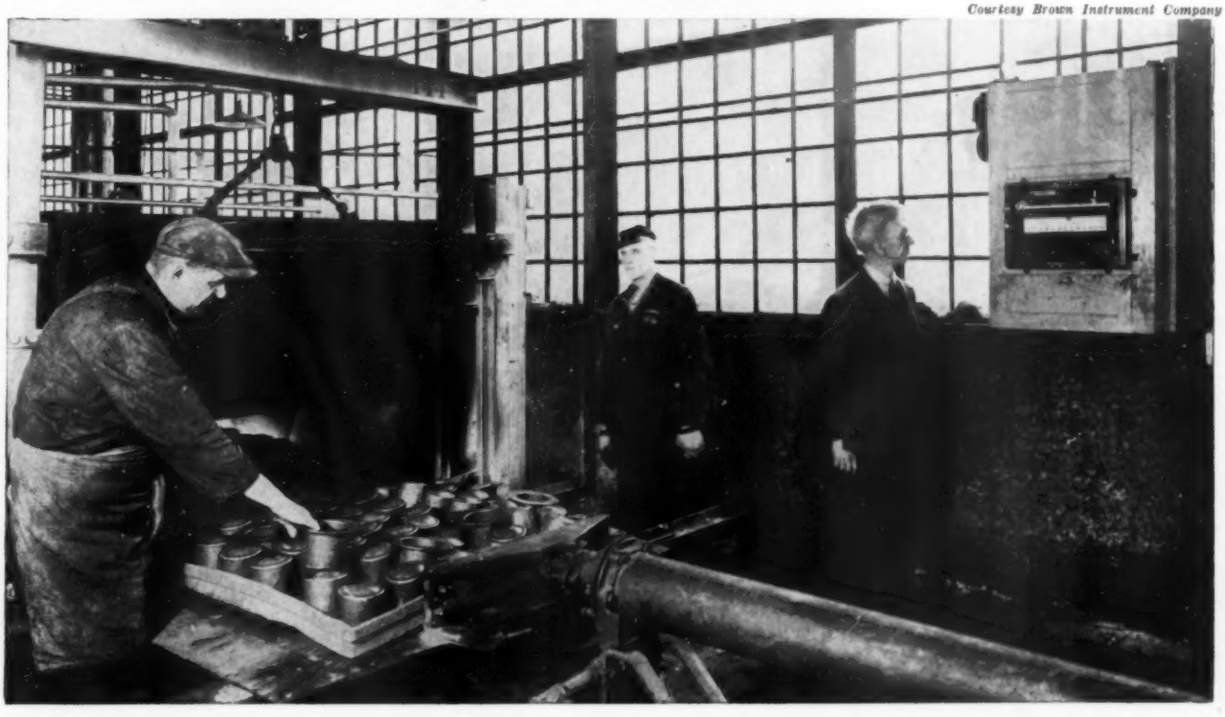
As METHODS OF heat-treatment have improved in recent years, so too methods and accuracy of temperature measurement have changed and improved. Demands for increased production and the desire for elimination of the human factor have created a need for automatic control of temperature. In fact, the elimination of the personal element has, to some extent, been hastened by the newer refined steels which require more accurate control of heating temperatures if the proper qualities are to be obtained. More stress is also being placed on the measurement and control of the gas atmospheres in furnaces. In the low temperature field of metal processing, plating, particularly, calls for good temperature control.

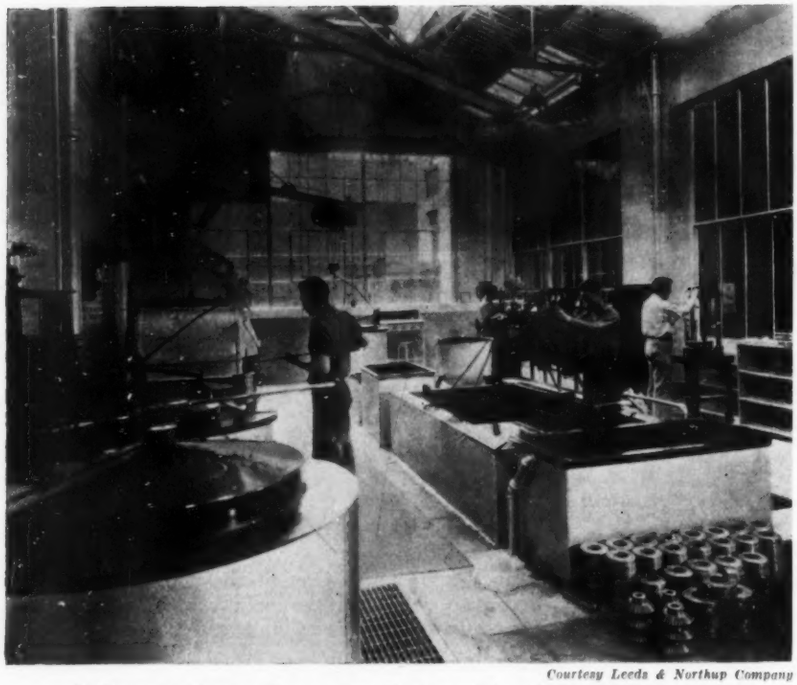
Instrument set-ups now range from a central heat-treat control room, with indicators, recorders and controls neatly arranged, down to one indicator-controller hanging on the wall. Yet each may perform satisfactorily and economically for the job at hand. The selection of instruments and elaborateness of set-up is a matter of money available, type and amount of work to be done, quality and number of personnel and shop management.

One of the present-day advances in the field of temperature instruments and controls is that to all practical purposes every contingency has been taken care of and these instruments may be "bought off the shelf." In other words, the buyer is not buying an experimental object but a device which has been thoroughly engineered and tested. All that is required is to make certain adjustments in the standard instrument to suit the particular case. It must be remembered that the purchase of these instruments is not a cure-all, but rather one step further toward the ideal condition of accur-

Indicating potentiometer proportioning controller regulates this pusher type annealing furnace leaves operator free to handle other work

Courtesy Brown Instrument Company





Courtesy Leeds & Northup Company

Indicators and controls are centrally located in this heat-treating room

ate temperatures for metals.

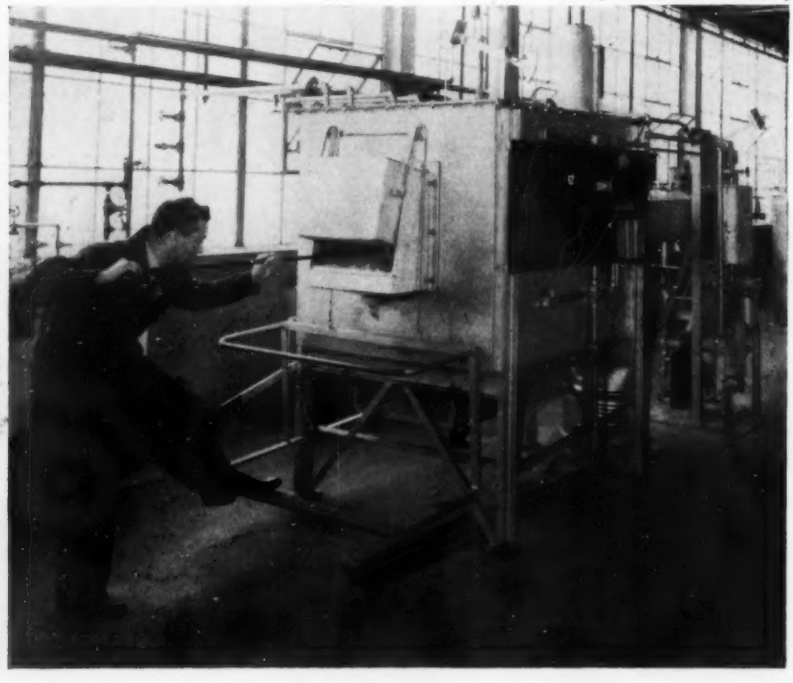
There are three systems of temperature measurement most commonly used in the metal-working field: thermocouple, radiation and optical. The thermoelectric method of measuring temperatures is the most commonly used. It is based on the principle that two dis-similar metals placed in contact and subjected to varying temperatures produce an electro-motive force which varies with the temperature. Thermocouples are located at various places within the furnace, depending on their use. Some feel that it is sufficient if the thermocouples are placed somewhere within the heating zone. Others prefer that the hot end be placed in contact with the material being heat-treated. In the case of baths there is some question about the location of the hot end as baths, large ones particularly, do not have a uniform temperature unless thoroughly agitated.

The materials used in thermocouples are of various kinds: the primary ones are platinum, combined with platinum-rhodium, chromel-alumel or iron-constantan. Platinum plus platinum-rhodium units are satisfactory up to 2600 F. to 3,000 F. but, because of the small size of the wires used, are easily contaminated and must be suitably protected at all times. Iron-constantan oxides above 1,500 F. but possesses a long life below this temperature. It is also more satisfactory than chromel-alumel in reducing atmospheres up to 1,800 F. Chromel-alumel is being used up to 2,200 F. in suitable atmospheres.

The radiation system of measuring temperatures is a variation of the thermocouple system. Heat radiated from a certain area of the part being treated is picked up by lenses or mirrors and transferred to the hot junction. Radiation measurement possesses certain advantages in that the thermocouple is located outside of the furnace and is not affected by gases at high temperatures.

Radiation type pyrometer sights temperature in this controlled atmosphere brazing furnace, is connected to indicator controller on panel board

Courtesy General Electric Company



Out of the Red

Radiation instruments are made in tubular form. The tube has lenses at the furnace end for picking up the heat intensity and transmitting it to the thermocouples or other heat sensitive device at the far end either directly or through some intermediate "receiver" system. Originally these instruments were limited to reading only high temperatures. Since they depend on the intensity of the heat they were ineffective in the black heat stages, and the minimum operating temperature was approximately 1,200 to 1,500 F. However, one company now announces that its radiation pyrometer will read down to 300 F.

Radiation instruments formerly had the further disadvantage that they could only be used on furnaces in which the work was surrounded by a gas. Other disadvantages were that any smoke or scale tended to introduce errors in the temperature reading. Recent models of the radiation type do not have an open-end tube for sighting into the furnace, but rather have a closed end tube which is placed in the furnace similar to the thermocouple. The heat of the tube is transferred to the thermocouples at the end of the tube

and the temperature readings are taken as above. This type possesses the advantage that it may be used in a bath of any sort in addition to being used in a gas atmosphere furnace.

In many cases, heat-treating practice is complicated by the fact that thermocouple instruments cause trouble because the thermocouple deteriorates in high temperatures even when protected by tubes. Gas diffuses through some protecting tubes easily at high temperatures. Instances have been reported where hydrogen filtered through the protecting tube and affected the thermocouple so badly that calibration of the thermocouple was required every fifteen minutes. The radiation pyrometer which keeps the thermocouple away from the effects of furnace gases is the cheaper to maintain where furnace gases have a deteriorating effect on thermocouples.

The optical pyrometer is not so widely used for heat-treating. Its primary use is in the steel mill or other metal-producing plants. Several improvements have been made recently in the optical pyrometer, one company having gone into production on a high-speed recording optical pyrometer. Minimum temperature for these instruments is in the range of 1,200 to 1,500 F., depending on construction. Recent advances in this field eliminate some errors by making use of a standard light in combination with a photoelectric cell to balance the light taken from the heated object. Heretofore the optical pryometer had not been adapted to recording.

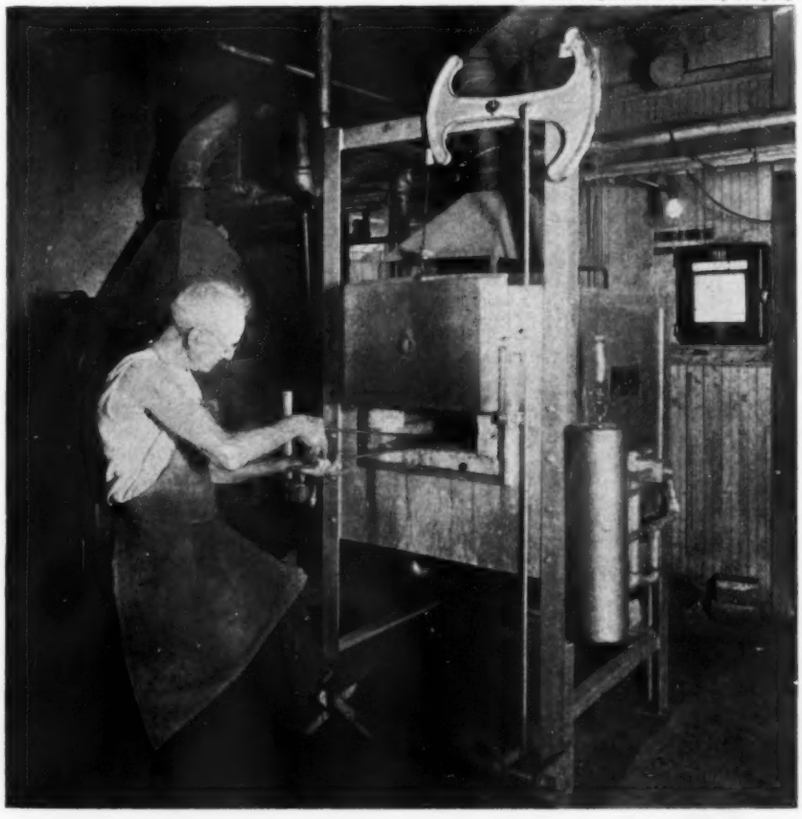
Most types of temperature pick-ups record the temperature, either on a dial or graduated scale, or by marking a record on paper, or both. Electro-motive-force which has been generated by the thermocouple is measured by a sensitive galvanometer of the millivoltmeter or potentiometer type. The galvanometer reads the small voltage generated by the thermocouple. Generally, indicating instruments have this voltage reading changed into the corresponding temperature readings.

In purchasing the millivoltmeter type of instrument, it must be remembered that these are affected by any resistance which may be in or later added to the thermocouple circuit. Any change in resistance of the leads or other factors which add resistance to the system such as poor contacts due to excessive oxidation introduce possible errors. For this reason it is necessary to purchase an instrument which has high resistance so that the resistance in the leads and thermocouples will be only a small percentage of the total resistance of the circuit. If a low-resistance millivoltmeter is used, suitable compensation must be made in all the thermocouples and leads, and the entire set-up must be checked frequently to be certain that there has been no change in calibration.

The potentiometer has the advantage that the varying resistance which may occur between the thermocouple hot end and the point of attachment in the recording instrument has little bearing on the temperature readings. In the potentiometer the voltage produced by the thermocouple is balanced against the drop of potential through a resistor carrying a current standardized by a standard cell. Some companies use a standard cell having a long life with consequent elimination of frequent checking of cell. On the other hand, some use a standard cell and introduce mechanical systems which automatically check the cell at frequent intervals.

Wise management combines the experience of the veteran with improved furnace controls of today. Electric instrument indicates, records and controls temperature of furnace

Courtesy Leeds & Northrup Company

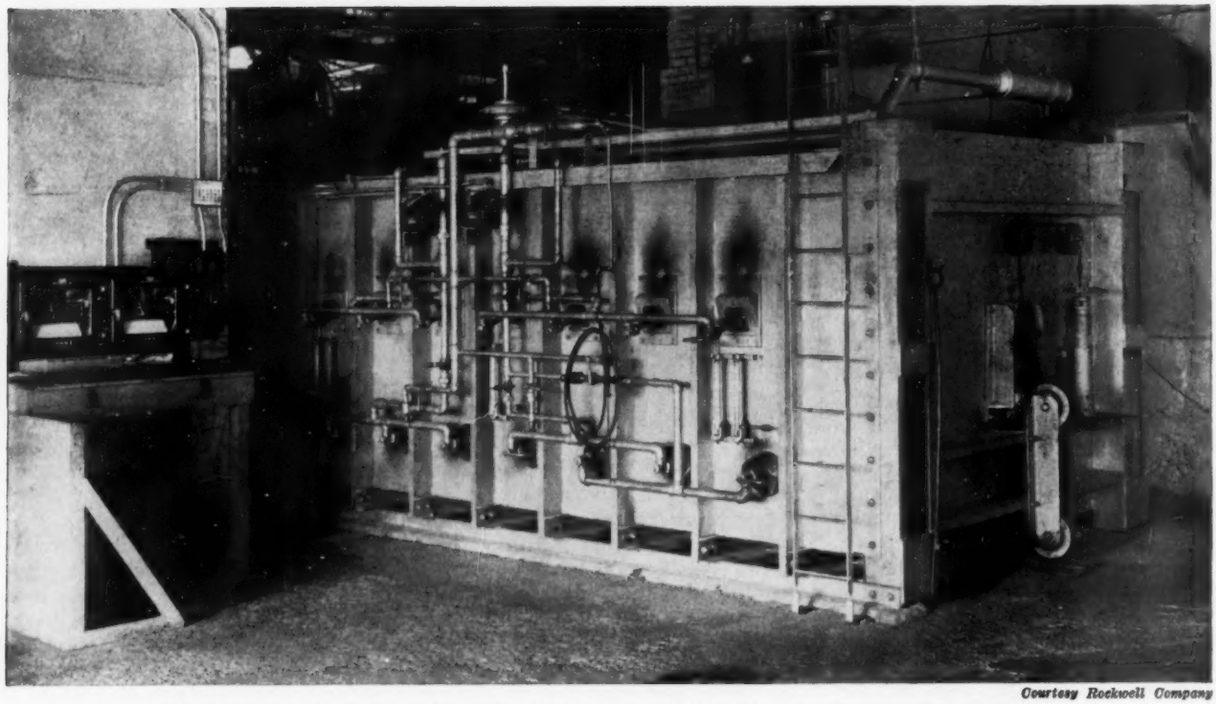


Draw the Line

Temperature instruments may not only possess the indicating feature but also may plot charts which draw a single curve or any number of curves. One company manufactures recorders with sixteen points. The record of each furnace or thermocouple is distinguished either by printing different colored dots, different numbers or different types of dots, or by drawing different types of curves.

For low temperature readings such as in plating, pickling and caustic cleansing baths, mercury, vapor or gas filled temperature measuring instruments are used. Anodic treatment of aluminum alloy at 95 F. is very critical and demands very close control to prevent spoilage. Chromium plating is done at 100 to 180 F. depending on amperage used. Normally no elaborate set-up is required. Recording of temperature may be desired for purposes of management. Warning lights may be used in connection with indicator.

It will be noted that the variables encountered in operation of the instruments demand that they be calibrated at regular intervals and their characteristics checked. The purchaser of instruments should buy some portable pyrometer or millivoltmeter set-up for checking his production



Courtesy Rockwell Company

Temperature of this gas-fired annealing furnace is recorded at left. Recorder transmits message to two ATC valve controllers on gas manifold when heat demand changes

instrument. One company has established a service which can be contracted for and which will provide periodic check of the installation and provide needed repairs.

In order to provide the feature of control, instrument companies have devised a system for transferring the very light galvanometer movement due to temperature changes to a positive recording and control action. One of the newer developments in this field involves the use of a photoelectric cell. It sets the control apparatus in motion when light reflected from the galvanometer mirror departs from the "edge" of the photocell. "Feelers" which check the position of the galvanometer needle at short intervals are used by another company. Needle location is transmitted to a separate system which actuates either electric motors or air valves for the control of fuel.

Some form of fuel control has been provided for most of the types of temperature measuring units. The question in the mind of the purchaser is, what type shall I buy? What is the percentage of accuracy? Temperature range? And to what extent shall I apply automatic control of heating operations?

There are cases where the size of the heat-treating department does not warrant the installation of elaborate automatic controls, and manual control must be depended on. In those cases, a thermocouple, selected for the proper temperature range, with suitable protecting tubes, and an indicating temperature instrument may be all that is required. An attachment to warn the operator that the furnace needs attention can be added. These signals may be lights or bells. Signals indicate whether the temperature is too high, just right, or too low, and the operator adjusts the heat accordingly.

A Lot for a Little

As an example of simplification, of installation a multi-point recorder is available which can be connected with several non-recording temperature indicating and control instruments. Multi-point switches, may be used with one indicator so that it can be used for reading from many scattered points. If this indicator is of the potentiometer type on corrections need be made for the different lengths of leads and distances to the furnaces. However, if it is a millivoltmeter instrument, certain compensations must be made in the leads so that the instrument will be recording the proper temperature. Some of the more elaborate systems have a temperature indicator mounted on a panel and connected to a series of phone jacks. The various furnaces are plugged in whenever a reading is desired.

An automatic two-position control was the first step in the replacement of manual control of fuel supply to the furnace combustion chamber. This system of control provides two rates of valve opening, one above and one below the normal demand. The control mechanism continually fluctuates between the two valve positions corresponding to these rates. More critical temperature requirements caused the production of the three-position type which introduced an intermediate stop between the upper and lower limits. Difficulties introduced by the mechanized heat-treating furnace then brought forth what has generally been called proportioning control. Proportioning control is based on the general premise that a certain definite valve opening is established for a certain temperature. This type of control gives better adjustment, and temperature variations can be held to close limits and to exceptionally close limits under favorable conditions.

This latter type, however, has one weakness. Once the valve has been adjusted for a certain process temperature range, any change in demand causes the fuel supply to be too small or too great depending on whether or not the load is increased or decreased. Lag which is caused by change in load or change in furnace condition slows up the response so that fuel changes no longer agree with demands. If an excessive demand is placed on the furnace the heat will be drained off faster than the valve setting which has previously been set for the desired temperature. Therefore, the furnace will fluctuate at a temperature whose

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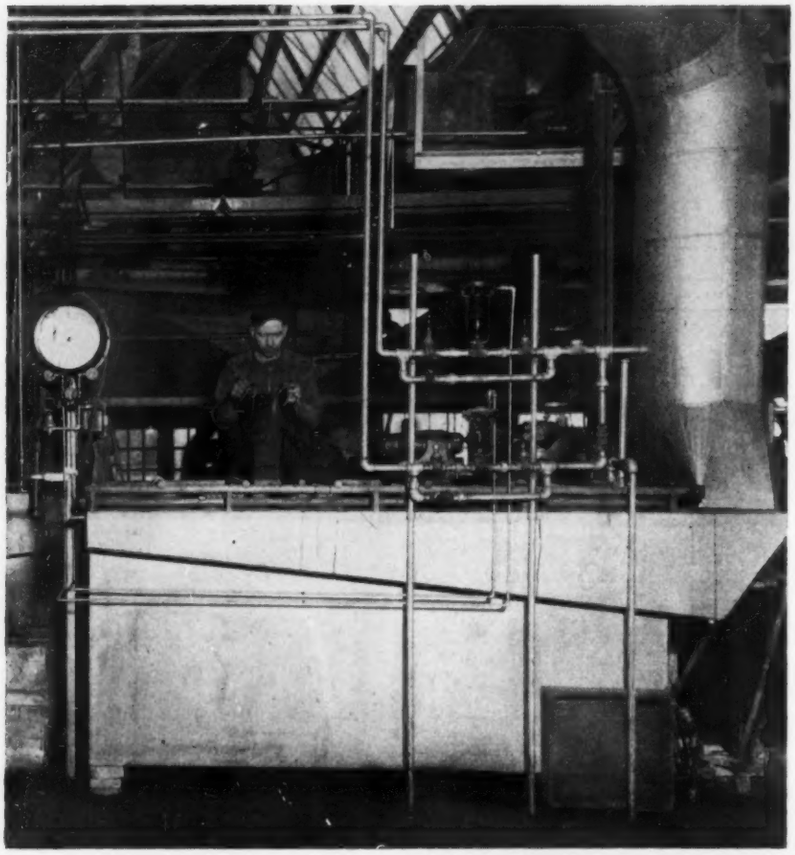
SALES OF MO-MAX BY 3 MONTH PERIODS



Combination instrument measures, records and controls temperature of the plating solution

Temperature of pickling solution is recorded and automatically maintained constant without personal attention

Courtesy The Foxboro Company

average is below the desired average temperature.

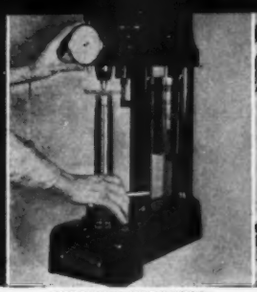
In order to overcome this defect most of the companies have now placed on the market controls which are referred to as a bias control, proportioning control with automatic reset, balancing control or any other of a number of terms, but which all mean approximately the same thing. That is, arrangements have been made in these controls to relocate the valve position in relation to the changed fuel requirements. In other words, if, in the original type proportioning control, the normal valve position corresponding to the holding temperature is 75 per cent open and the valve is moving a certain percentage of travel above and below this position, the newer type of control automatically changes the normal position to 70 or perhaps 80 per cent opening as may be required by decreasing or increasing demand.

In selection of these controls it must be considered whether or not the work is to be held to close limits, and if so, which of several controls offered is the best. If, for example, one were to purchase instruments for the measurement and control of a nitriding process, several factors immediately present themselves: the temperature must be held at about 1100 F., gas or liquid may be used, and considerable time is required to accomplish the process. With these factors in mind we would first of all select an iron-constantan thermocouple which is satisfactory for the temperature involved. Very probably we would connect the thermocouple to a combination temperature indicating and control instrument. Whether or not the management desires a check on the complete heat will govern whether or not the instrument shall be sufficiently elaborate to make a temperature record.

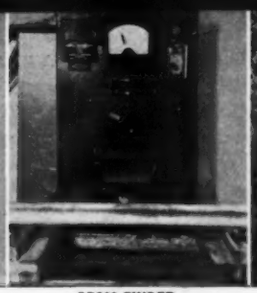
The cost of automatic controls and recorders may be considered as opposed to the cost of operation by hand. The cost of a two-position controller is approximately half that of the finest throttling control.

Generally proportioning or throttling control is used with oil or gas-fired furnaces to give smooth control of temperature. Valves may be operated either by air motor or by electric motor. In either case, valves allow for infinite adjustment. In electric furnaces different groupings of heat elements are cut in or out of circuit by a pyrometer. To relieve the coarseness of this type of control one company manufactures an electric furnace control which places the input on a time basis. In other words the entire bank of resistors in the furnace are cut in and out of circuit by an interruptor so designed that the amount of interruption to continuous current flow is automatically changed by changing heat demand. This automatic readjustment may be patterned to give proportioning control or "bias" control. Where the temperature at which the material is being held is very critical and there is very small allowable

CHECKING CASTING TEMP.



CHECKING HARDNESS



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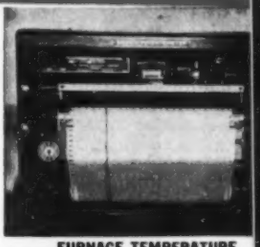


FURNACE TEMPERATURE

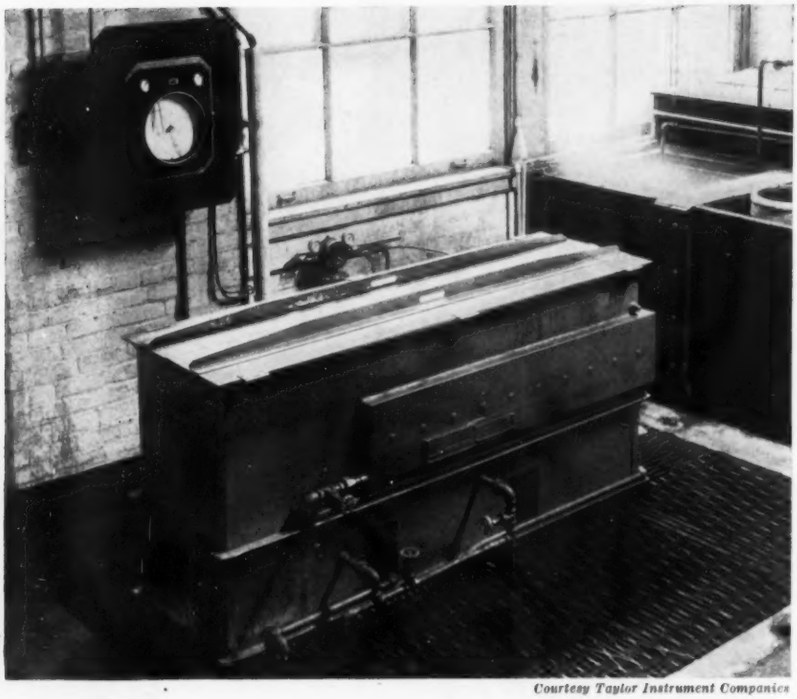
FINISHING TEMPERATURE

CHECKING ANALYSIS

SURFACE INSPECTION

CHECKING SIZE

MACRO STRUCTURE



Courtesy Taylor Instrument Companies

Instrument keeps vapor at proper level in degreaser, controls temperature of liquid, regulates pressure and furnishes record of degreaser operations

variation, the throttling control is almost necessary. This is particularly true in any continuous mechanical process where there is continual fluctuation in load demand and where there is apt to be considerable process lag. On the same basis in certain batch processes in pot furnaces a two-position control is thoroughly satisfactory.

As the control of temperature has become more and more mechanical and developments in the field have solved many of the problems, another difficult factor in heat-treating has come into prominence. This factor is furnace atmosphere which causes trouble due to its carburizing or decarburizing or scaling effects. Many different mechanical devices have been placed on the market whose purpose is to supply definite kinds of gas for furnaces. However, until recently there was no form of recorder available which permitted quick readings of the furnace atmospheres. In the past year there has been placed on the market a system of measuring and recording the CO_2 and hydrogen content present in furnace atmosphere. In other words, it indicates whether the atmosphere is oxidizing or reducing. It also will record free oxygen present in excess of two per cent. Manual operations are then required to adjust any variations in the furnace atmosphere.

Another bothersome feature in oil or gas fired furnaces is the possibility of temporary failure of the flame. There are several patented devices on the market which shut off gas or oil supply to prevent explosion if the fire goes out. More elaborate systems will relight the burners and continue furnace operations without attention. Generally no attempt is made to have a protective device on the automatic control system so that if one of the controls fails another goes into action. This feature is taken care of by a separate attachment which will shut the furnace down until attention can be given to it and the trouble discovered.

Other fields of temperature control are quenching, plating, pickling and rust-proofing methods. Many depend on accurate control of the bath temperatures for the success of the process. All these temperatures are comparatively low, and a liquid or a gas-filled bulb or a thermocouple may be used for picking up the temperature. As in heat-treating the elaborateness of the instrument installation depends on the situation existing in any plant. Where the personnel involved is kept busy producing a large quantity of work, an indicating temperature control instrument with control of temperature is desirable. Again the matter of having a recorder depends on the wishes of the management.

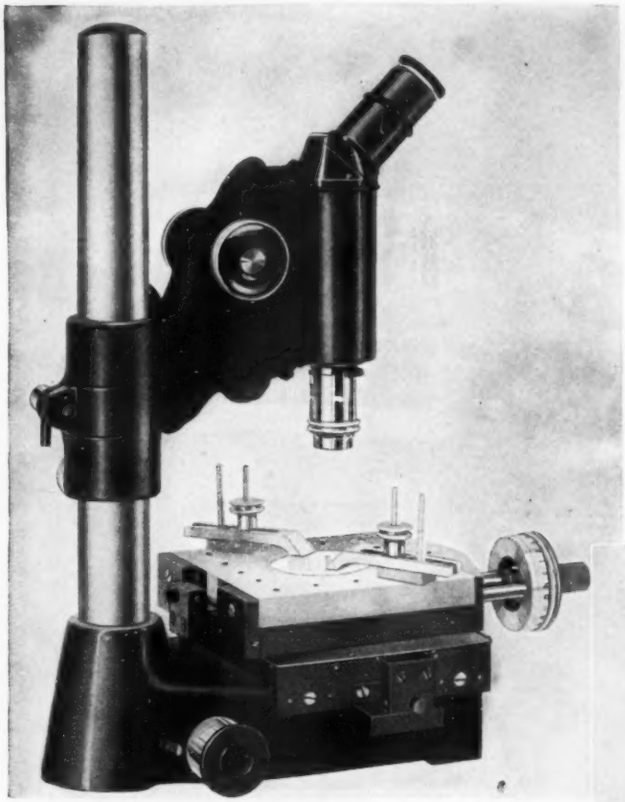
Since efficient and economical operation of a degreaser involves the maintenance of a specific solvent temperature controllers are applied to the apparatus to make the operation automatic. A temperature controller maintains the prescribed vapor level by locating a temperature-sensitive bulb above the surface of the liquid. As the solvent vapors reach the bulb, the controller cuts down the supply of steam. Pressure control is essential because excessive pressures cause violent boiling of the solvent. Furthermore, as the solvent becomes contaminated, its boiling temperature rises, making it necessary to increase the steam pressure to vaporize the solvent. Properly adjusted steam pressure provides a good indication of solvent contamination.

Acknowledgment is hereby given to the following companies for their aid and comment; Automatic Temperature Control Company, The Bristol Company, Brown Instrument Company, The Foxboro Company, Leeds & Northrup Company, The Lewis Engineering Company, Lindberg Engineering Company, C. J. Tagliabue Mfg. Company, Taylor Instrument Companies, Wheelco Instruments Company.

Temperature Control Analysis—Element Data

Courtesy Brown Instrument Company

	Thermometers — Type					*Thermocouples — System*				
	Pressure				*Resis.*	*Potentiometer*			*Millivoltmeter*	
	Vapor	*Blind M-H Vapor*	*Gas*	*Mercury*	*Nickel*	*Base Metal*	*Rare Metal*	*Radiation*	*Base Metal*	*Rare Metal*
Min. Temp. (°F) Recommended	—10	—50	—40	—40	—150	—300	—300	1000	—300	—300
Max. Temp. (°F) Recommended	600	700	800	1200	300	2400	3000	3300	2400	3000
Min. length of range (°F)	100	40	150	25	20	300	800	1500	400	1500
Accuracy (% of Range)	1	.....	1	1	½	½	½	½	1	1
Max. length of leads or tubing (ft.)	200	30	200	50	2500	2500+	2500+	2500+	Calibrated	



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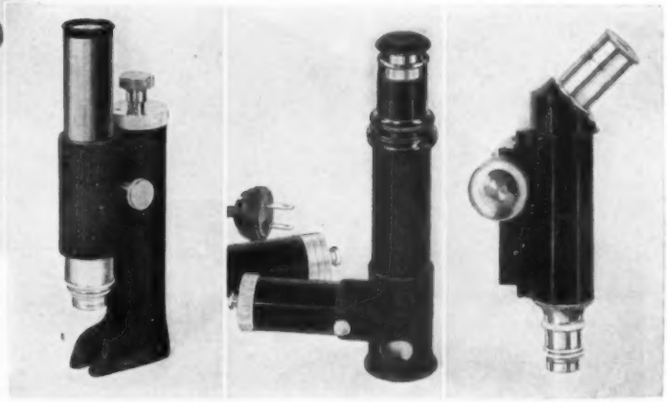

Above—B & L Toolmakers' Microscope. At right (left to right)—Shop Microscope, Brinnell Microscope, Microscope Body Tube.

OPTICAL methods of inspection and control are an invaluable aid in reducing expenses and maintaining quality standards in the metal working industries. B & L Instruments, for use in machine shops and metal working plants, are designed to stand up under the most rigorous shop use, yet to retain the accuracy that has made them first choice in mechanical laboratories throughout the world. From watchmakers' glasses up to a Toolmakers' Microscope that is the last word in precision workmanship, many instruments that will further progress in manfacturing and inspection in the metal working industry are completely described in the B & L Catalog D-22. Send for it today. Bausch & Lomb Optical Co., 618 St. Paul Street, Rochester, New York.

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Booth E – 32

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These parts are of both intricate and unusual design and give evidence of the advantages of using J&L Steel. Of particular interest will be the display featuring finished parts formed of strip and sheet products rolled on the new J&L 96-inch Continuous Strip Mill.

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Tricks for Heat-Treaters

Like any other art, practical heat-treating depends on many tricks of the trade. Here are some kinks gathered from men in industrial and jobbing plants. Acknowledgment for data and for checking that data are made to: James Salmon and J. E. Edgerly, of the Philadelphia Works, General Electric Company; J. H. Bockrath, of Wiedemann Machine Company; Horace C. Knerr, consulting engineer and president of Metallurgical Laboratories, Inc., Philadelphia; and Haig Solakian, chief metallurgist, A. A. Holden Company.

TO PREVENT CHIPPING OUT OR CRACKING AT SHARP CORNERS IN DIES

Tie $\frac{1}{16}$ in. soft iron wire around the die opening at each corner. When the die is quenched, the wires will shield the corners from the full effect of the quench. The corners will be softer than the remainder of the cutting edge by perhaps 6 points Rockwell C scale. Better wearing qualities of the die will be achieved by this trick.

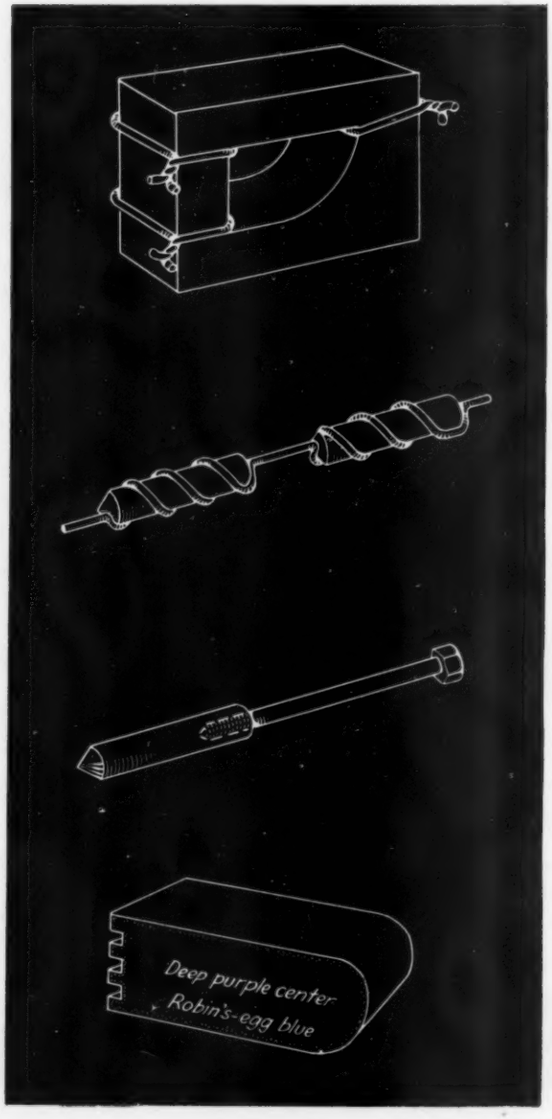
TO HARDEN SMALL PUNCHES WITHOUT DISTORTION

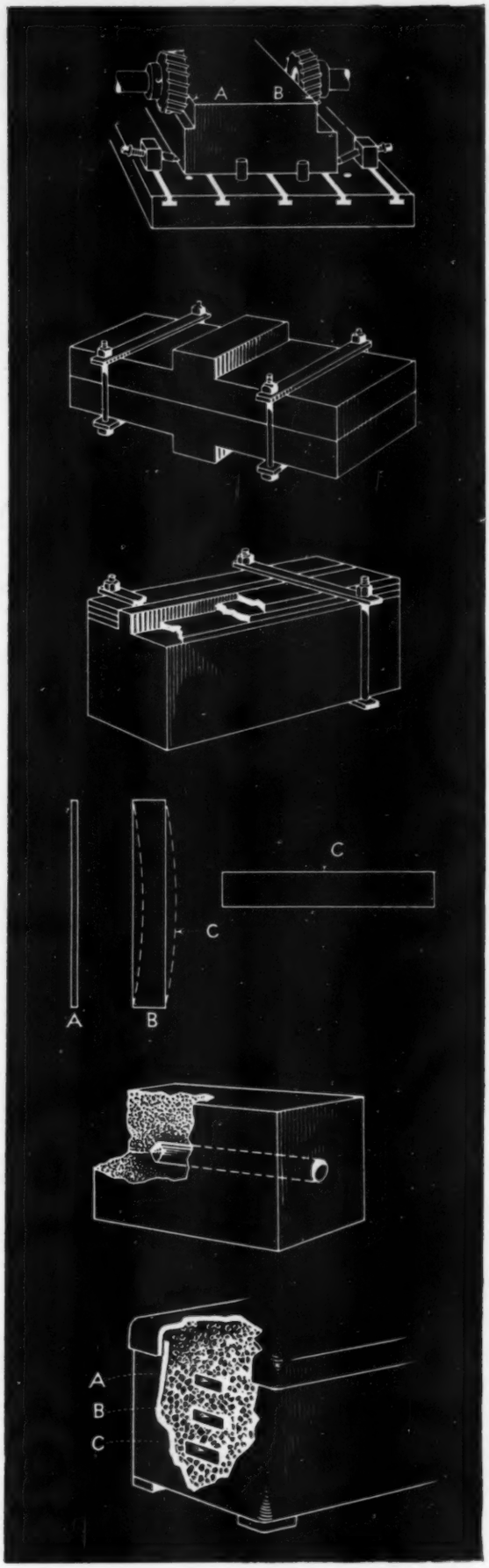
SKETCH 2—Put a kink in $\frac{1}{16}$-in. soft iron wire and place the kink next to the point of the punch. Then wrap the wire around the punch, finishing with a kink at the other end. The punch cannot slip out endwise. Other punches can be wired in sequence. The group is then heated and quench endwise and vertically, avoiding handling with cold tongs which causes distortion. The wire does not cause noticeable soft spots under the coils, as a file test will show.

SKETCH 3—Where one end of the punch is tapped, a capscrew can be screwed in for handling the punch. Here again heating the handling device as well as the tool prevents distortion. If punches are long, suspend vertically in the furnace during heating. In this case an eyebolt can be substituted for the capscrew, permitting stringing on a suspension rod.

TO ASCERTAIN CARBURIZING DEPTH WITHOUT ETCHING

Take a sample and grind off the case on one side. Then heat the piece to a blue color, when the case will be sharply differentiated from the core. The case will be revealed by a brilliant robin's egg blue, whereas the core will be a dark purple. Comparison of etched and blued samples will show that this method is effective in determining the depth of case and also the uniformity of case.





TO PREVENT DISTORTION OF RECTANGULAR PIECES

The heat-treater should insist that work of this character, upon which cuts have been taken at *A* and *B*, come to him with an equal depth of metal removed from both sides. If the machinist is careless of this point and removes more at *B* than at *A*, the piece is likely to bow. This point applies mainly to work with a decarburized layer.

TO OVERCOME EFFECT OF A SHOULDER

Where a piece has a shoulder at one side, it is desirable to clamp two pieces together with the shoulders on opposite sides as shown. The tendency of one piece to distort is then offset by a similar tendency of the other piece to distort in the opposite direction. These pieces are billets, hence the straps. Use wire for small objects. There are cases, however, where this practice causes bowing because of unequal quenching of inner and outer surfaces.

TO PREVENT TONGUES FROM CRACKING

A small tongue on a piece of heavy body will frequently crack off unless a full rectangle is built up with loose pieces as indicated by the dotted lines. These loose pieces should be wired or strapped tightly to the billet and the whole placed before the furnace door for some time to allow gentle preheating. This practice will prevent the heat from being absorbed too rapidly at the tongue as compared with the rest of the piece. The packing strips will also modify quenching action. Strains that would cause cracking off are overcome in most cases, but normalizing as the first step may be necessary.

TO PREVENT BOWING OF THIN RECTANGULAR PIECES

A long thin piece like a steel scale is shown edgewise at *A* and flatwise at *B*. Frequently it will be found that in a lot of such pieces the bowing will all be more or less toward one edge, as at *C*. If instead of quenching the part vertically it is quenched horizontally with side *C* uppermost, the opposite side will harden first, thus counteracting any downward bowing. This practice is particularly good for pieces with a thin V section. Some heat-treaters slide the work in at an angle to the surface of the quench in order to prevent distortion of long thin work.

TO PREVENT BULGING OF FLAT HARDENED BLOCKS

Drill a $\frac{3}{16}$- or $\frac{1}{4}$-in. hole lengthwise in the block from one end, stopping approximately 1 in. from the opposite face. Bulging of the flat faces at the center is induced by internal stresses set up where the corners cool first. With the longitudinal hole, however, the internal stresses may collapse the hole partially, and the block will be removed from the quench in a flat condition.

TESTING THE ACTION OF CARBURIZING COMPOUND

Put test pieces *A, B* and *C* at the top, center and bottom respectively of *large* carburizing boxes in order to check the action of the compound in all sections of the box. The top and sides of large boxes may heat first, and by the use of test specimens, top center and bottom, the uniformity of carburizing can be checked. Some people prefer feet on the box to permit heating underneath, or else to use an underfired hearth.

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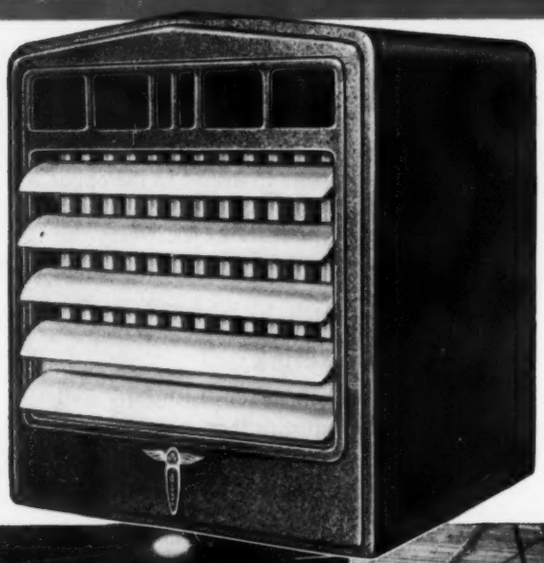
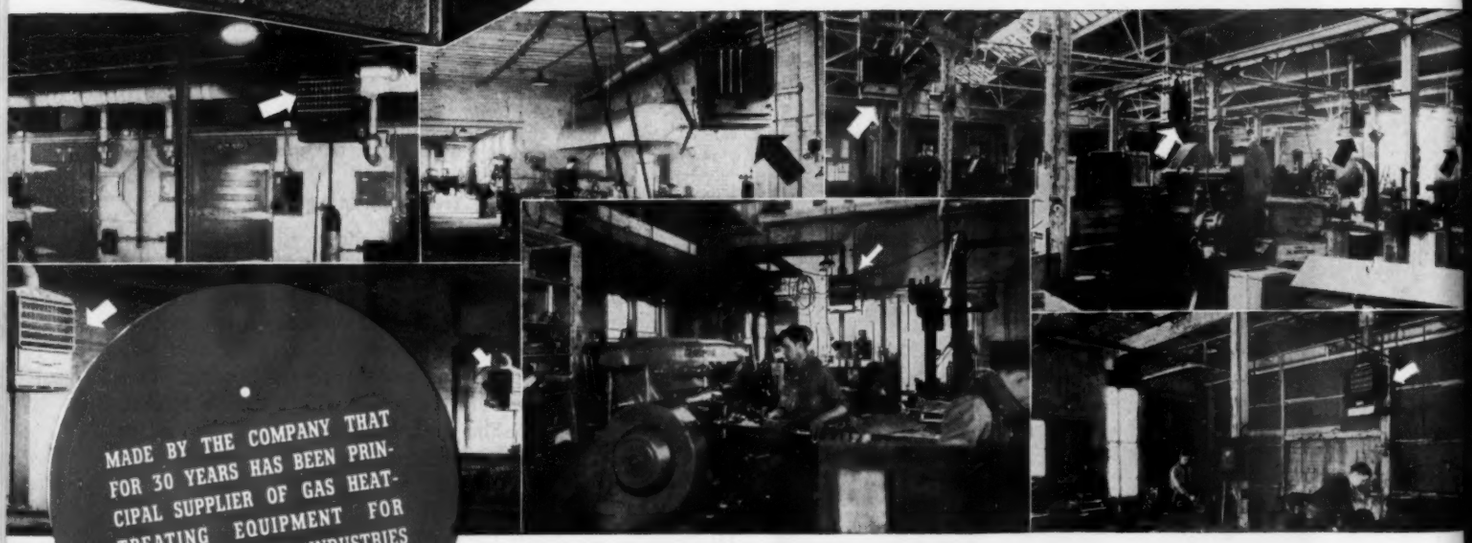
HAVE MODERN SPACE HEATING



ENGINEERED TO HEAT-TREATING STANDARDS OF EFFICIENCY *in the new*

Janitrol GAS-FIRED UNIT HEATERS



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THOUSANDS OF HIGHLY SATISFACTORY JANITROL UNIT HEATER INSTALLATIONS GIVE THIS EQUIPMENT INDUSTRY'S OVERWHELMING ENDORSEMENT

NOW THESE OUTSTANDING IMPROVEMENTS ASSURE STILL GREATER EFFICIENCY AND ECONOMY

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2 **ADDED PROTECTION** . . . safeguarding the unit against overheating . . . a new and exclusive Janitrol device for automatic operation of fan in any emergency.

3 **NEW QUIET OPERATION** . . . assured by *new heat exchanger* of non-resonant processed metal; exclusive Janitrol *Sonic-Silencers;* new *quiet-type fan.*

● Fourteen models . . . all uniform in handsome external design . . . ranging in capacities from 45,000 to 400,000 Btu per hour input . . . Units suspended from ceiling. No central heating plant needed. Save space . . . save time . . . save money. Circulate comfortable, healthful heat exactly where and when needed. . . See your local gas company.

WRITE for interesting booklet . . . "The ABC's of Plant Heating."

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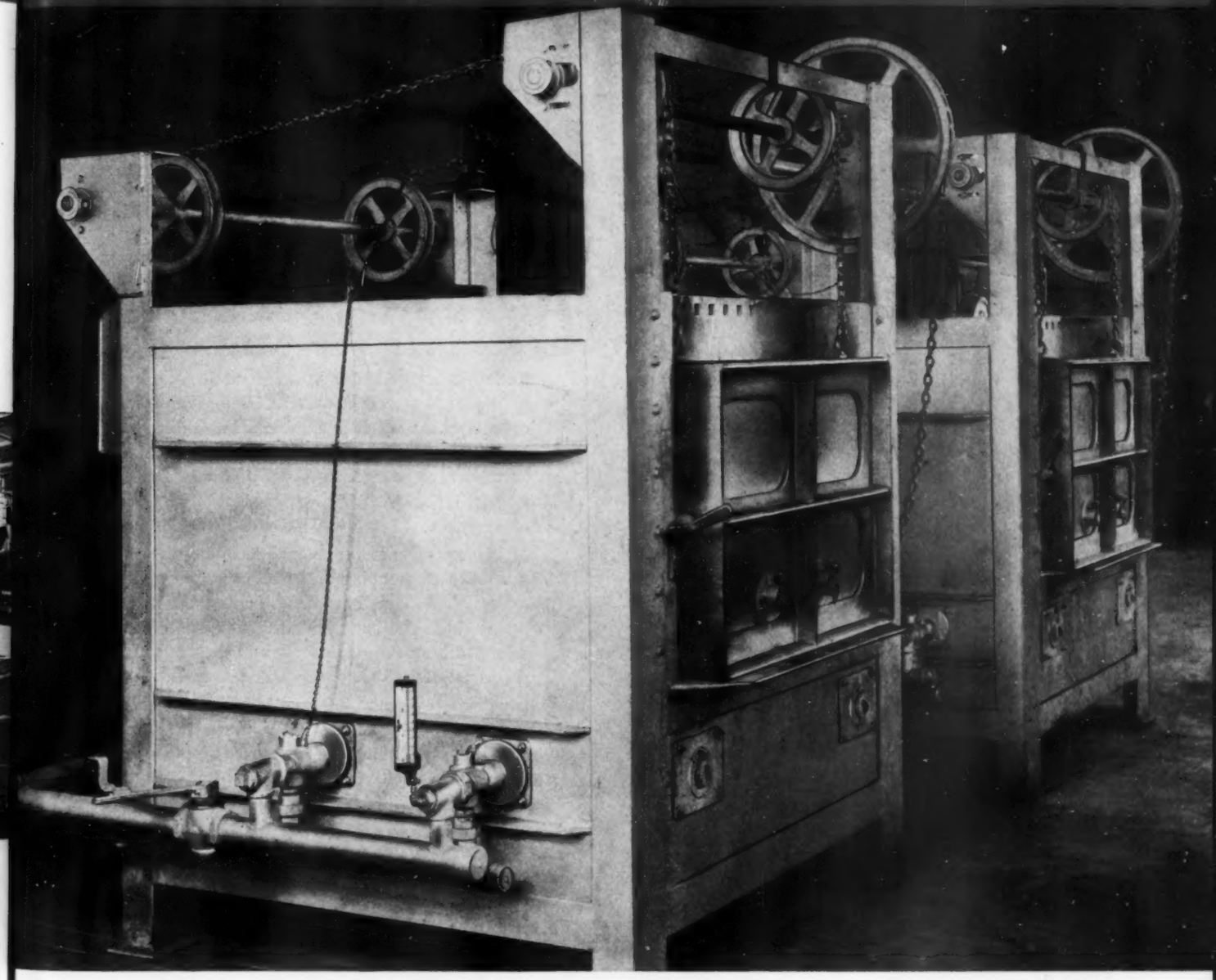
SC STANDARD RATED GAS FIRED FURNACES AT OHIO BRASS CO



● Throughout industry, wherever heat is used, there are SC Standard *rated* gas-fired heat treating furnaces in operation. Some, like the two large oven furnaces above at the Ohio Brass Company, are used for general heat treating purposes. Others—such as air heaters, cyanide and lead pots, forge furnaces and immersion heaters, are for specific processes. More than 200 sizes and types of SC standard *rated* furnaces are available. Also available are SC gas-fired burners in 47 different types and more than 400 sizes providing for your exact requirements.

Whether you desire to bring an old furnace up-to-date with new and more efficient burner equipment or replace obsolete equipment entirely, SC engineers have the answer for your problems in virtually any kind and size equipment your requirements suggest. Ask for the SC catalog of standard furnaces and burner equipment now.

SURFACE COMBUSTION CORPORATION, Toledo, Ohio

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Builders of ATMOSPHERE FURNACES and HARDENING, BRAWING, NORMALIZING, ANNEALING FURNACES for CONTINUOUS or BATCH OPERATIONS

Flame Hardening rail surface with AIRCO Hardening Torch mounted on AIRCO-DB motor-driven Radiagraph.

THE process of heat treating with the oxyacetylene flame is not new. It has long been used by Railroads for hardening of rail ends and rail surfaces and has saved them untold sums in replacement costs.

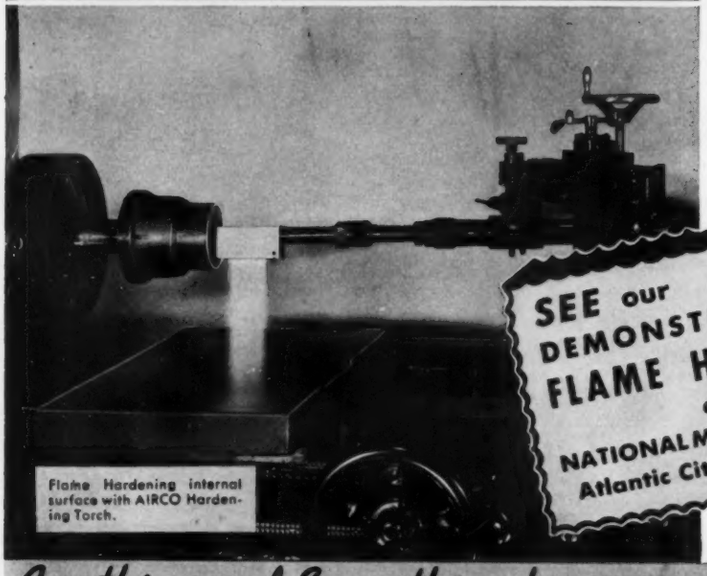
Newly perfected AIRCO *Equipment greatly enlarges the scope of* FLAME HARDENING

Flame Hardening spur gear with AIRCO Adjustable Yoke and Gear Hardening Tips.

Recently, however, the scope of the process has been greatly extended by AIRCO'S development of equipment which makes practical the flame hardening of selected areas of large machine parts such as gears, cam shafts, journals, liners, wheels, rails, etc., *with rigid control of degree of hardness and depth of penetration.*

Machinery manufacturers are welcoming the opportunity this equipment gives them of using oxyacetylene flame hardening, because the process produces the hardness effect of furnace heat treatment, but avoids distortion of the body and reduction of its shock resistant properties.

It will pay everyone interested in the heat treatment of machine parts to investigate flame hardening possibilities. The story is told in the new FLAME HARDENING BULLETIN. A copy is yours for the asking. Write for it—today.



Flame Hardening internal surface with AIRCO Hardening Torch.

SEE our DEMONSTRATION OF FLAME HARDENING at the NATIONAL METAL EXPOSITION Atlantic City, October 18-22

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Heat-Treatment for Wrenches

In producing a light-weight, alloy steel box-head wrench, it was decided that in addition to outstanding surface properties, a good wrench material must respond readily to fabrication. The steel must have qualities of strength and toughness, combined with high strength. It must retain good ductility and toughness with a high yield strength. This combination of properties in the plastic range permits the wrench to deform under excessive loads before breaking, and is a distinct advantage in service. An experienced mechanic, feeling the warning "give" resulting from overloading, can relax his pressure and save the wrench, whereas a brittle tool would snap suddenly without preliminary indication of failure.

A regular nickel-molybdenum steel of S.A.E. 4650 grade was selected and the following heat-treat technique gave all the above desired qualities, according to *Nickel Steel Topics*. After forging, an annealing treatment, consisting of a soaking heat at 1500 F. was followed by furnace cooling. This prepared the wrenches for the machining operation, which must be performed without difficulty in order to produce a close-fitting box with a smooth surface. After machining the wrenches were oil-quenched from 1450 F., and drawn to a Rockwell C hardness of 40-45.

Quenching Kinks

HUGH SOLAKIAN
Chief Metallurgist
A. F. Holden Company

Water-hardening steel tools often crack. Sometimes this can be eliminated by quenching the tools in brine or water for a few seconds to insure the desired hardness on the surface, and then immediately transferring the piece into oil and holding the tool there until it reaches the temperature of the oil.

Often quenching water is saturated with oxygen or air. During quenching these gases, along with water vapor, form pockets on the surface of the tool. Consequently, there is uneven cooling that causes cracking and distortion. These gases can be eliminated by agitating the water to allow them to escape, or by heating the water and allowing it to cool to room temperature.

One of the main causes of tool breakage is insufficient preheating before introducing the tool into the high heat. The tool should be preheated at 600-1200 F., depending upon the type of material, before it is carried into the high temperature.

Another common cause of cracking is delay of tempering after tools are quenched from high temperatures. Whether the tool is high-speed or plain carbon steel, it should be tempered as soon as it reaches the room temperature after quenching.

High-speed steel tools should be allowed to reach room temperature after quenching before they are disturbed and carried into the wash. These steels are very sluggish and slow in the transformation of their internal structure, and if they are placed in hot water before they are cool enough to handle they will invariably crack.

Oil quenching of high-speed steel means relatively rapid cooling. When the size of the tool is exceptionally large, it is advisable to warm the quenching oil, especially in winter months, to about 125 F. The oil should be checked under all conditions for presence of water. The water stays at the bottom of the oil, and if high-speed tools are allowed to drop into the oil quench and hit the water they crack immediately.

BUZZER INDUSTRIAL GAS EQUIPMENT

LOOK into the possibilities of these fast, high-heat furnaces . . .

1400° F. IN 15 MINUTES
1800° F. IN ONE HOUR
With higher temperatures possible

The Oven Furnace (at the left) combines not only speed in heat-up time but *retained* heat evenly distributed in the heating chamber.

READY FOR IMMEDIATE USE BY SIMPLY CONNECTING TO THE GAS SUPPLY. No Auxiliary equipment necessary.

Rugged construction and wide range of heat control are a few of the many features.

Complete full details on request.

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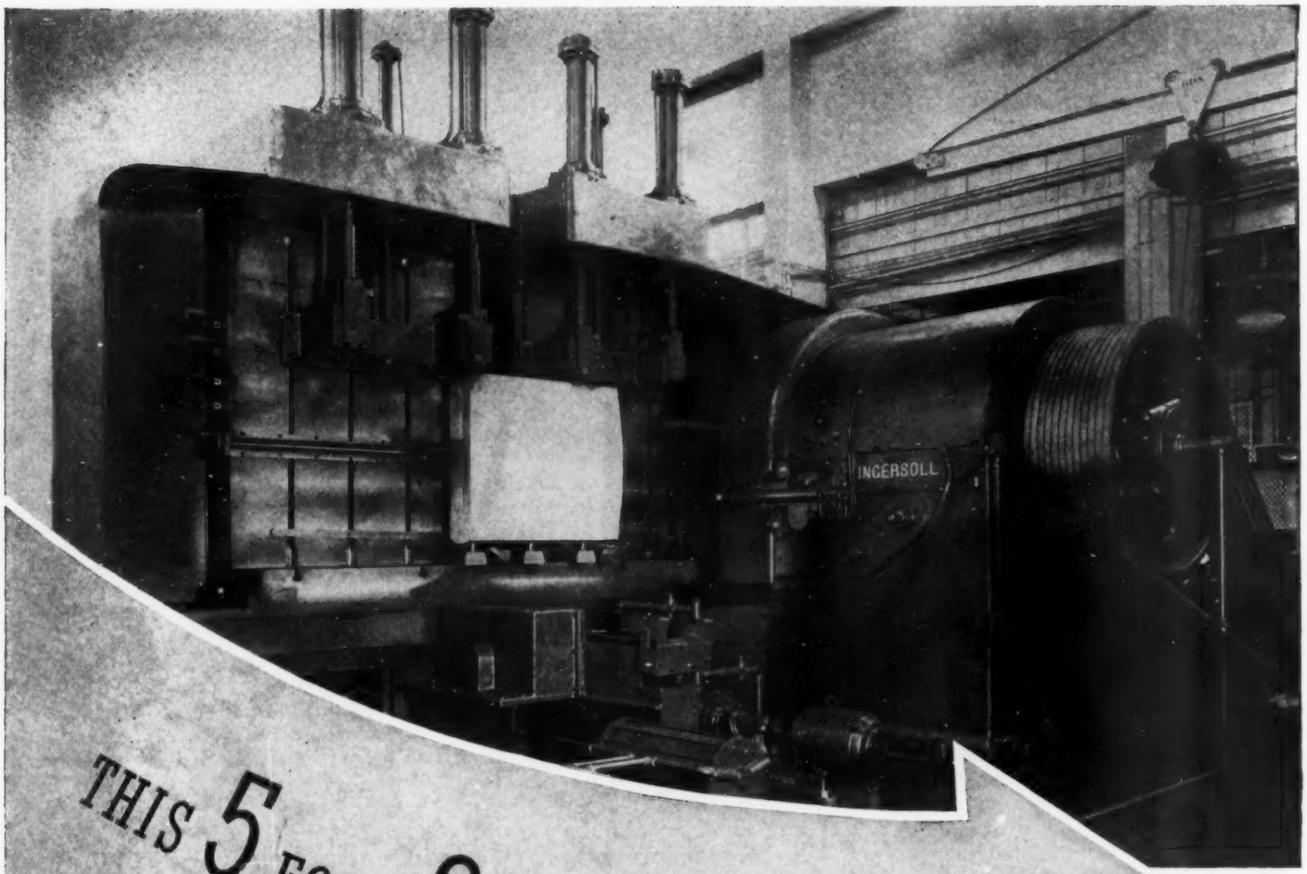
The High Temperature Melting Furnace (shown on the right) is particularly adapted for salt baths and cyaniding at temperatures from 600 to 1600 degrees F., for lead hardening, melting aluminum, etc.

Temperatures easily controlled because of the wide range of turn-down of the burner.

Send To-day for Catalog of the Complete Buzzer Line. FREE on Request.

CHARLES A. HONES INC., 121 So. Grand Ave., Baldwin, N. Y.



THIS 5 FOOT 8 INCH FIRTHITE CUTTER

HAS 64 FIRTHITE BLADES

"HOLLYWOOD" superlatives are required to properly describe this truly huge Ingersoll Milling Cutter which is equipped with 64 FIRTHITE tipped inserted blades. This is probably the largest Carbide Tipped face milling cutter ever assembled. Its outside diameter is 68 inches and it slabs aluminum ingots up to 66 inches wide. A 150 H.P. motor drives it at *3000 ft. per minute.* Removing *3/16" of stock* per pass at feed rates up to *72" per minute.* 60 blades do the roughing while 4 blades set 90 degrees apart and ahead on the face on a smaller diameter do the finishing. These 4 finishing blades have wide faced FIRTHITE tipped cutting edges to sweep the milled surface smooth and flat to prepare the ingot for the subsequent rolling and drawing operations.

This cutter effectually proves that size imposes no limitation on the use of FIRTHITE Sintered Carbide tipped tools. FIRTHITE helped make this unusual application possible. FIRTHITE also helps to make all cutting tools from single point turning tools to intricate fluted types more efficient and durable.

Write for price list giving new lower prices on tools, bits and tips.

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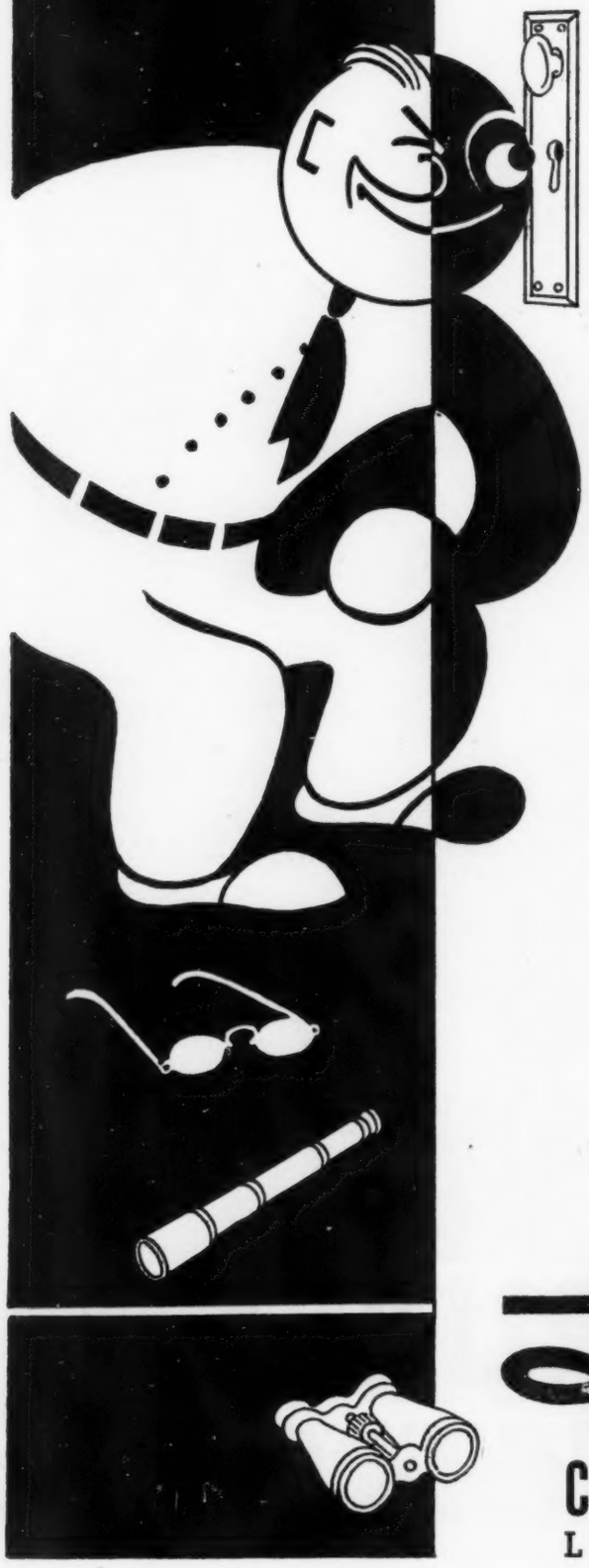
SEEING IS BELIEVING—*sometimes*



When you look at your meter, for a temperature reading, you can usually believe what you see. But remember that the instrument gets its temperature story from the thermo couple thru the Lead Wire. Thus, while your meter and couple may be O. K., your temperature reading will be wrong unless the Lead Wire is right.

If you use Chromel-Alumel Couples, your leads also should be made of Chromel-Alumel. Any other kind of leads are apt to create an error—because where they join the couple, they introduce another E.M.F. that may add to or subtract from the E.M.F. of the couple. If the couple handle doesn't get very warm, the error is negligible. But the hotter that junction gets (and you know it often gets very hot), the greater that error becomes. To use "compensating" leads with Chromel-Alumel Couples is risky. . . . You eliminate at least this one source of error by using couples and leads of the same composition. Therefore, for accuracy, use Chromel-Alumel Leads with Chromel-Alumel Couples. For the whole story, send for Folder-GT. . . . Hoskins Manufacturing Co., Detroit, Michigan.

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LEADS AND COUPLES

Pitting? No! Etching? No!
Dimension Changes? No!
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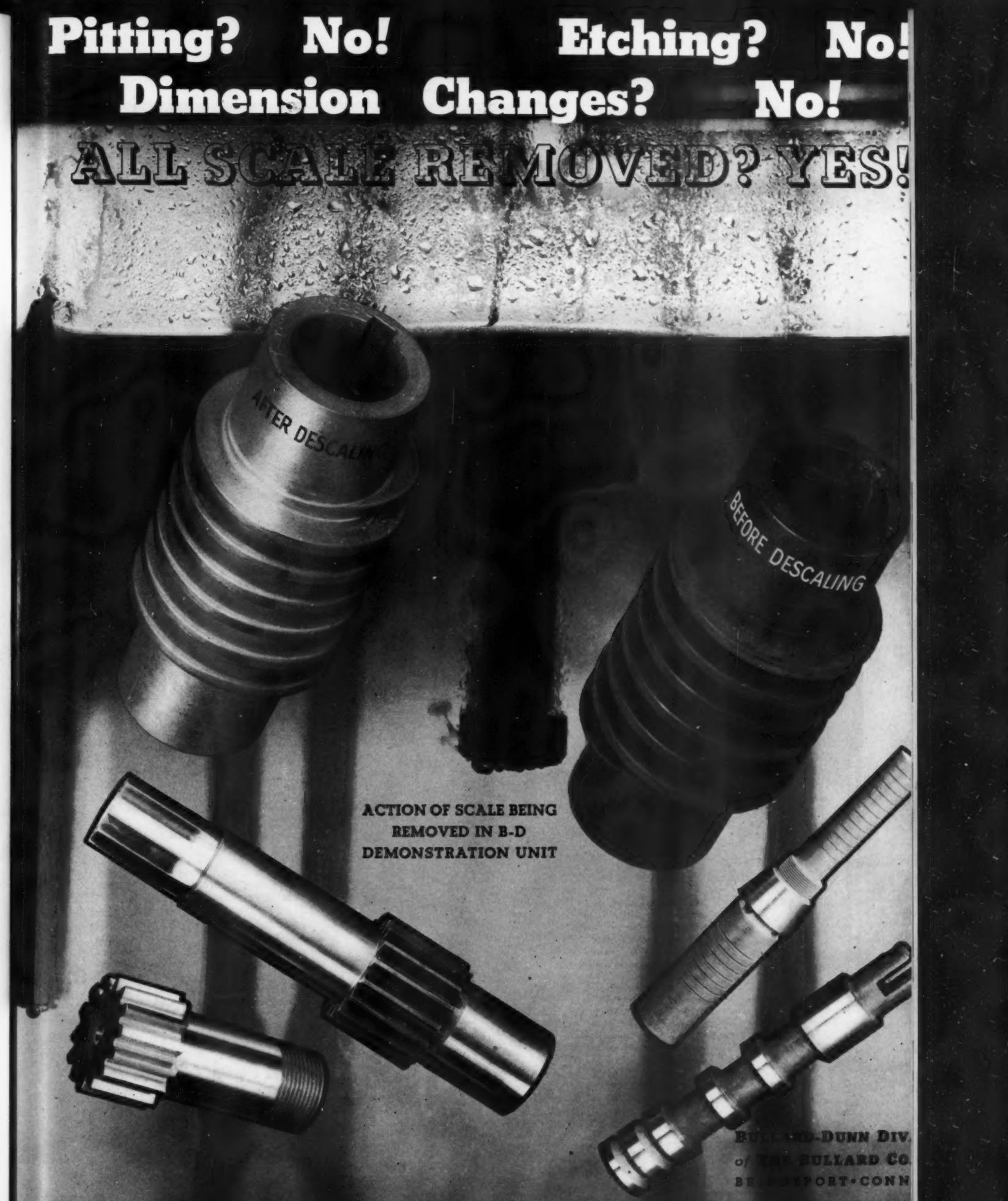

ACTION OF SCALE BEING
REMOVED IN B-D
DEMONSTRATION UNIT

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50% TO 100% SAVINGS IN GRINDING TIME . . . TO 100% GAIN IN WHEEL LIFE . . . WITH BULLARD-DUNN PROCESS BEFORE GRINDING

The ANALY-GRAPH is fool-proof, simple in operation and easily installed on any furnace—electric or fuel fired—wherein furnace atmospheres are controllable.

A constant sampling of the furnace gases directly in contact with the work is conducted by means of an analyzing unit. Briefly, the procedure is as follows:

Furnace gases are drawn through a sampling tube, drier and filter. The gases upon entering the *Gas Analysis Cell* cause the electrically heated cell to get hotter—increasing the electrical resistance. The rise and fall of electrical resistance with changes in furnace atmospheres affects the galvanometer in the recording instrument which produces a continuous record of oxidation or reduction.

Thus, the furnace man is supplied with a continuous record, on a standard 12-inch chart, of the furnace atmosphere as produced by any degree of combustion.

. . . and you CONTROL A VITAL FACTOR *in Heat Treating*

No longer need you wait for a report on the furnace atmosphere while work may be spoiling. Direct reading of the Brown ANALY-GRAPH measures furnace atmosphere in simple, workable terms. It gives accurate, unfailing response to variations in the atmosphere and humidity conditions—whether combustion is complete or incomplete.

To measure furnace atmospheres with the Brown ANALY-GRAPH—while work is being treated—is to *know in advance* that the final result *will exactly meet* the desired specifications. It means, further, that you can easily avoid faulty hardening . . expensive retreatments . . rejections due to excessive scaling, undesired carburizing or decarburizing.

The Brown ANALY-GRAPH enables you to check the exact amount of oxidation and reduction in the furnace atmosphere—for any metal—at any temperature. Thus, you have a tangible, instantaneous and continuous means of controlling quality and uniformity of result—a VITAL FACTOR in heat treating.

An outstanding advantage is that once the ideal condition is established and recorded, it can be quickly duplicated whenever desired—batch after batch—by any operator.

Other advantages and detailed descriptive data are given in Bulletin No. 92-1. Write THE BROWN INSTRUMENT COMPANY, *a division of Minneapolis-Honeywell Regulator Co.*, 4501 Wayne Avenue, Philadelphia, Pa. Offices in all principal cities. Toronto, Canada: 117 Peter Street—Amsterdam-C, Holland: Wijdesteeg 4—London, England: 70 St. Thomas' Street, S.E.1.

See The Analy-Graph in Operation at The National Metal Exposition—Booth B-75-79

BROWN DIVISION INDUSTRIAL INSTRUMENTS

BROWN FURNACE ATMOSPHERE RECORDER

To Measure and Control is to Economize

AMERICAN GAS FURNACE CO.
PIONEERS IN 1878
LEADERS TO-DAY

MODERN HEAT TREATING EQUIPMENT

for

GAS CARBURIZING
CLEAN HARDENING
CLEAN ANNEALING
CLEAN NORMALIZING
TEMPERING
"NI-CARB"

The importance of atmosphere control has long been recognized by us. As far back as 1902 our rotary continuous machines were provided with a special burner to achieve this very purpose.

May we tell you more about our original developments and latest designs.

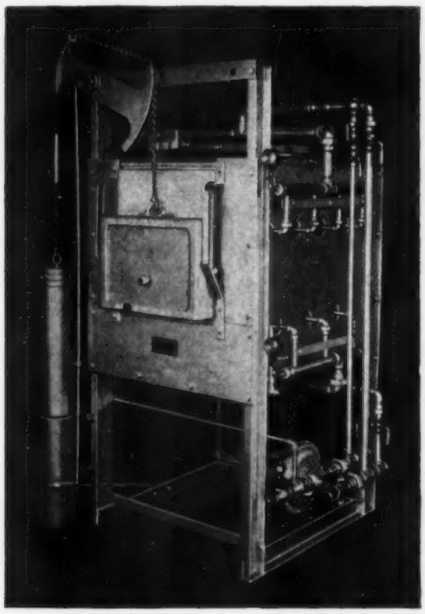
Our latest development will be shown at the

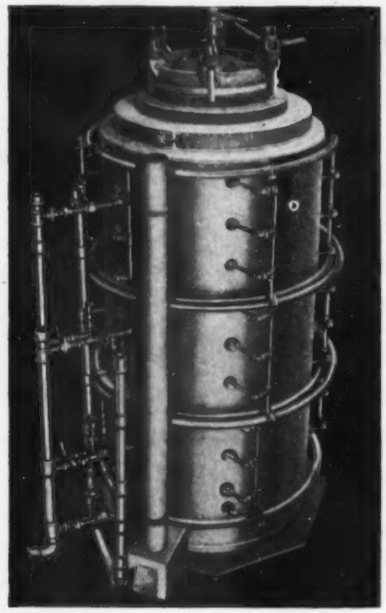
A.S.M. Exposition.
Atlantic City, Oct. 18 to 22

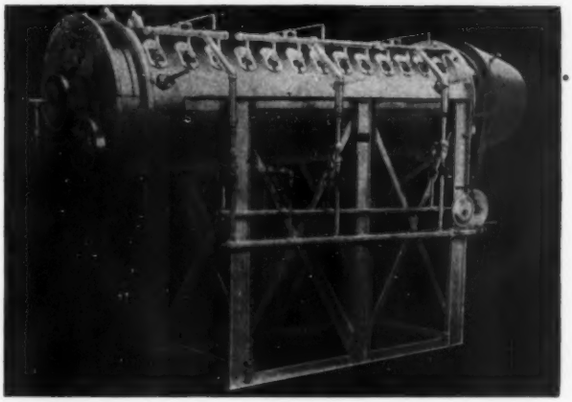
●

● (Right) Atmosphere control in this machine recommends it for clean hardening and annealing, etc., as well as quality carburizing at minimum cost.

● (Below) Atmosphere control in this Oven Furnace of advanced design gives clean hard work.







● (Above) Any desired atmosphere can be carried in the retort of this Vertical Furnace for annealing, hardening and gas carburizing with high quality and low labor and overall cost.

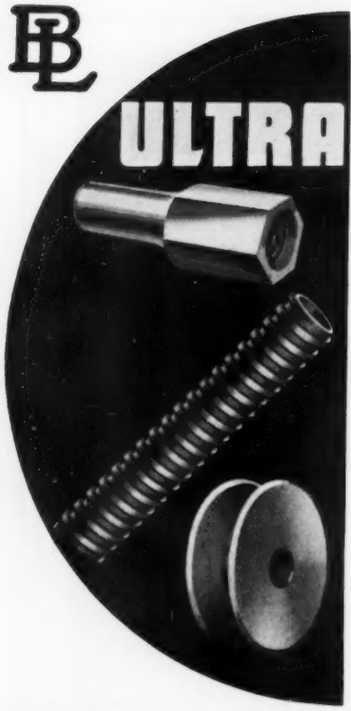
● (Left) Atmosphere control in this continuous rotary produces highest quality work on a tonnage basis with low labor and overall cost.

American Gas Furnace Co.

Elizabeth, New Jersey

Engineering Representatives in Principal Cities

Congratulations to the American Society of Metals and the best of success for the National Metal Show at Atlantic City, October 18-22



B & L ULTRA-CUT SCREW STOCK for Free Machining

Open Hearth SCREW STOCK *for* Carburizing

In fabricating duplicate machine parts, it pays to select the screw steel just as carefully as your automatic equipment. By referring your problems to B & L engineers, you can get the proper steel for your purpose . . . for there is a grade of B & L Cold Finished Screw Steel to meet your every requirement.

B & L Ultra-Cut gives greatly increased machining rates with finely finished parts. Longer tool life with less "down time" insures maximum production economy.

B & L Open Hearth is a quality screw steel well adapted for parts subject to carburizing, cyanide or liquid hardening, as in developing a file-hard surface . . . producing ductile cores for heavy stresses . . . or to permit bending, swaging or minor forming operations. Your inquiries on screw steels are invited.

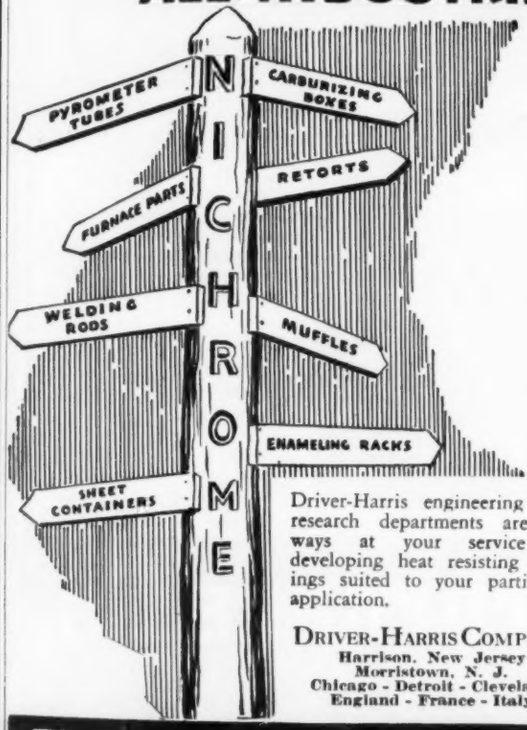
Cold Drawn Bars • Extra Wide Flats • Ground Shafting • Special Sections • Ultra-Cut Steel • Alloy Steels

BLISS & LAUGHLIN, INC.

HARVEY, ILL. *Sales Offices in all Principal Cities* BUFFALO, N.Y.

Pointing to

ALL INDUSTRIES



Driver-Harris engineering and research departments are always at your service in developing heat resisting castings suited to your particular application.

DRIVER-HARRIS COMPANY
Harrison, New Jersey
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Chicago - Detroit - Cleveland
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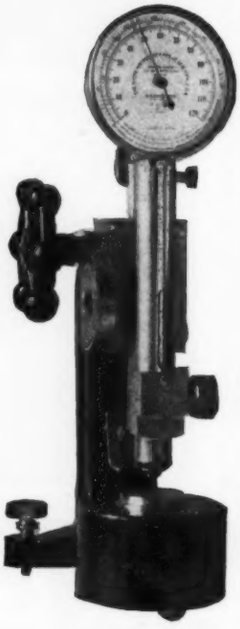
The Original Heat Resisting Alloy

HARDNESS TESTING



The **STANDARD SCLEROSCOPE** (Now highly Improved) for more than twenty years has made good and is still used for doing the world's hard work in testing. In general use for specifications purposes. Simple, Sturdy, Comparatively Inexpensive. Illustrated bulletins free. **FOR QUALITATIVE AND QUANTITATIVE HARDNESS MEASUREMENT,** under Static Pressure, the **MONOTRON** is the only machine now available. Operative up to over 2000 Diamond Brinnell. Avoids errors due to spring in test pieces. Takes readings with the load on, avoiding reversal lash errors. No setting to zero. Operates at highest Speed. Has solved many old laboratory and shop problems. *We also make the Durometer for testing the hardness of rubber.* Comprehensive bulletins free.

THE SHORE INSTRUMENT & MFG. CO.

Van Wyck Ave. and Carll St., Jamaica, New York

Agents in all Foreign Countries

"Fur," *said the Deacon,* "'t's mighty plain thut the weakes' place mus' stan' the strain . . ."

THE ONE-HOSS SHAY

Now in building of chaises, I tell you what,
There is always *somewhere* a weakest spot,—
In hub, tire, felloe, in spring or thill,
In panel, or crossbar, or floor, or sill,
In screw, bolt, thoroughbrace,—lurking still,
Find it somewhere you must and will.

But the Deacon swore (as Deacons do, with an "I dew vum" or an "I tell yeou,")
He would build one shay to beat the taown
It should be so built that it *couldn't* break daown:
—"Fur," said the Deacon, "'t's mighty plain
Thut the weakes' place mus' stan' the strain;
'n' the way t' fix it, uz I maintain,
Is only jest
T' make that place uz strong uz the rest."

HE was born 200 years too soon—that delightful deacon who built the famous one-hoss shay — for he was an engineer at heart. With his penchant for making each part "uz strong uz the rest" he was doing just the job that automotive engineers are accomplishing today with such outstanding success.

And the parallel does not stop there.

When the deacon "inquired of the village folk" he was going to headquarters for help and cooperation in finding better and stronger materials, just as automotive engineers are when they call in alloy specialists from the metallurgical laboratories of Carnegie-Illinois.

When he selected "crossbars of ash from the straightest trees" and "steel of the finest, bright and blue" he was exercising the same painstaking selection of materials as automotive engineers when they specify newly developed grades of U·S·S Carilloy Alloy Steels to strengthen vital parts.

We salute these ingenious automotive engineers—the modern prototype of Holmes' ingenious Deacon.

We take pride in supplying them with the finest alloy steels it is now possible to make, for strengthening the vital parts in their designs. We take pleasure in working with them, developing together even finer alloy steels to achieve new heights in smooth performance.

Taken from "The One-Hoss Shay" by Oliver Wendell Holmes—because it so aptly illustrates the reason for the increasing use of U·S·S Carilloy Alloy Steels.

U·S·S CARILLOY ALLOY STEELS

CARNEGIE-ILLINOIS STEEL CORPORATION

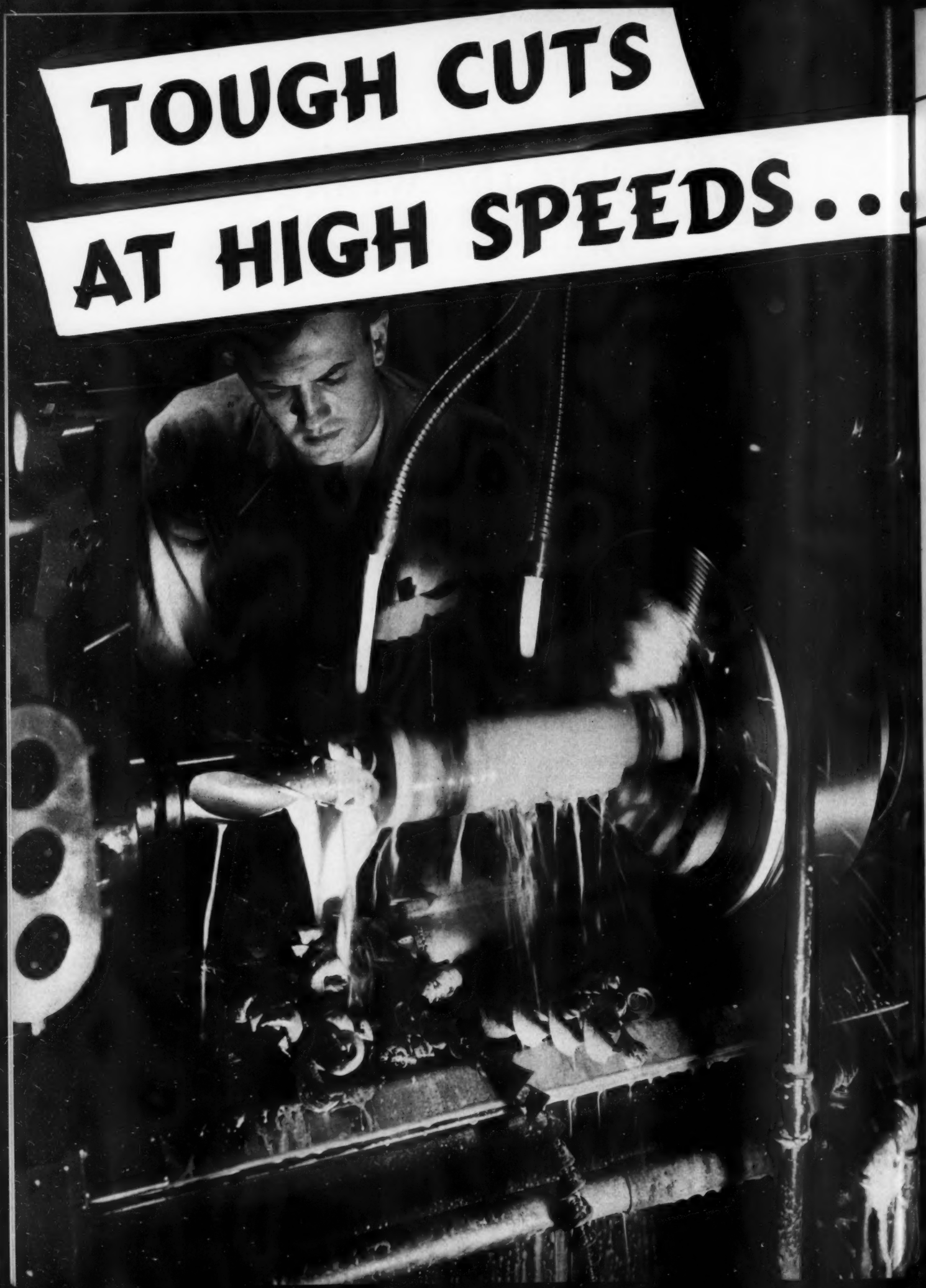
Pittsburgh *Chicago*

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

TOUGH CUTS AT HIGH SPEEDS...



ACCURACY AND FINISH

with SUNOCO

Power . . . rigidity . . . flexibility . . . accuracy built in the modern lathe for high-speed production and fine finish depend to a great extent on the cutting fluid.

SUNOCO's performance has won the approval of many machine tool builders. Outstanding among them is the Warner & Swasey Company, who know from experience that SUNOCO will aid their machines to perform at rated capacity and produce accurate, fine-finish work.

SUNOCO assures fast, chatter-free, clean-cutting action at the point of the tool. Tools wear longer and produce more pieces per tool grind.

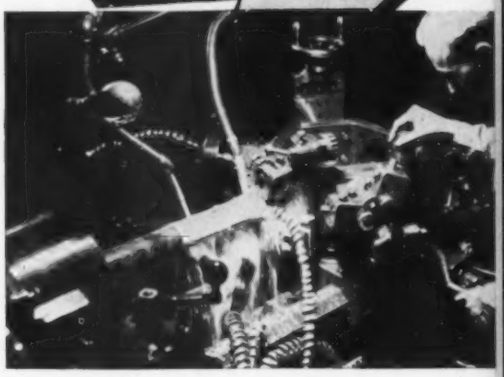
In your shop . . . with your material . . . under your own working conditions, test SUNOCO. It will demonstrate and convince you of its value as an aid in machine tool efficiency.

SUN OIL COMPANY, PHILADELPHIA, PA., U. S. A.

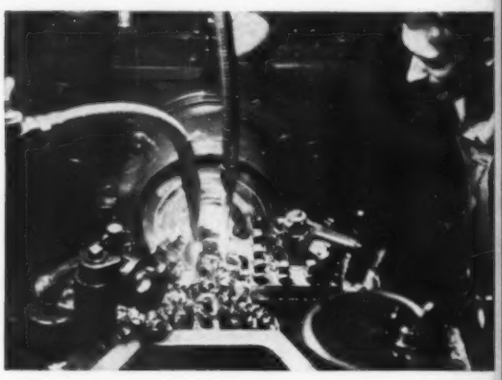
Offices and Warehouses in more than 100 cities

Subsidiary Companies:

Sun Oil Co., Ltd., Montreal, Toronto • British Sun Oil Co., Ltd., London, England

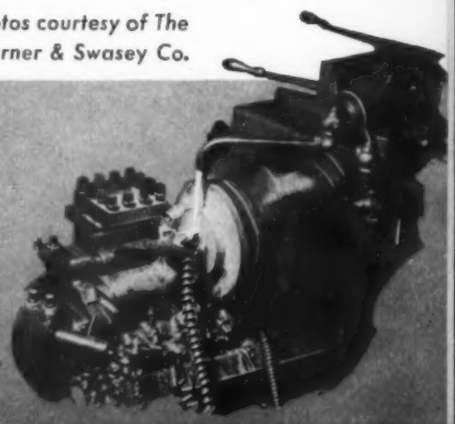


Heavy Duty Bar Turner taking a heavy cut on Warner & Swasey 2-A Universal Heavy Duty Turret Lathe



The Warner & Swasey 3-A Universal Heavy Duty Turret Lathe (Bar capacity of machine 4½"—Swing 23½")

Photos courtesy of The Warner & Swasey Co.

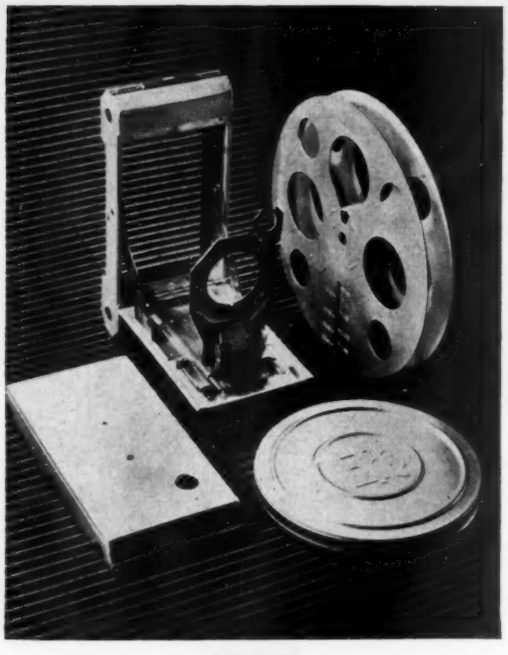


SUNOCO

EMULSIFYING

CUTTING OIL

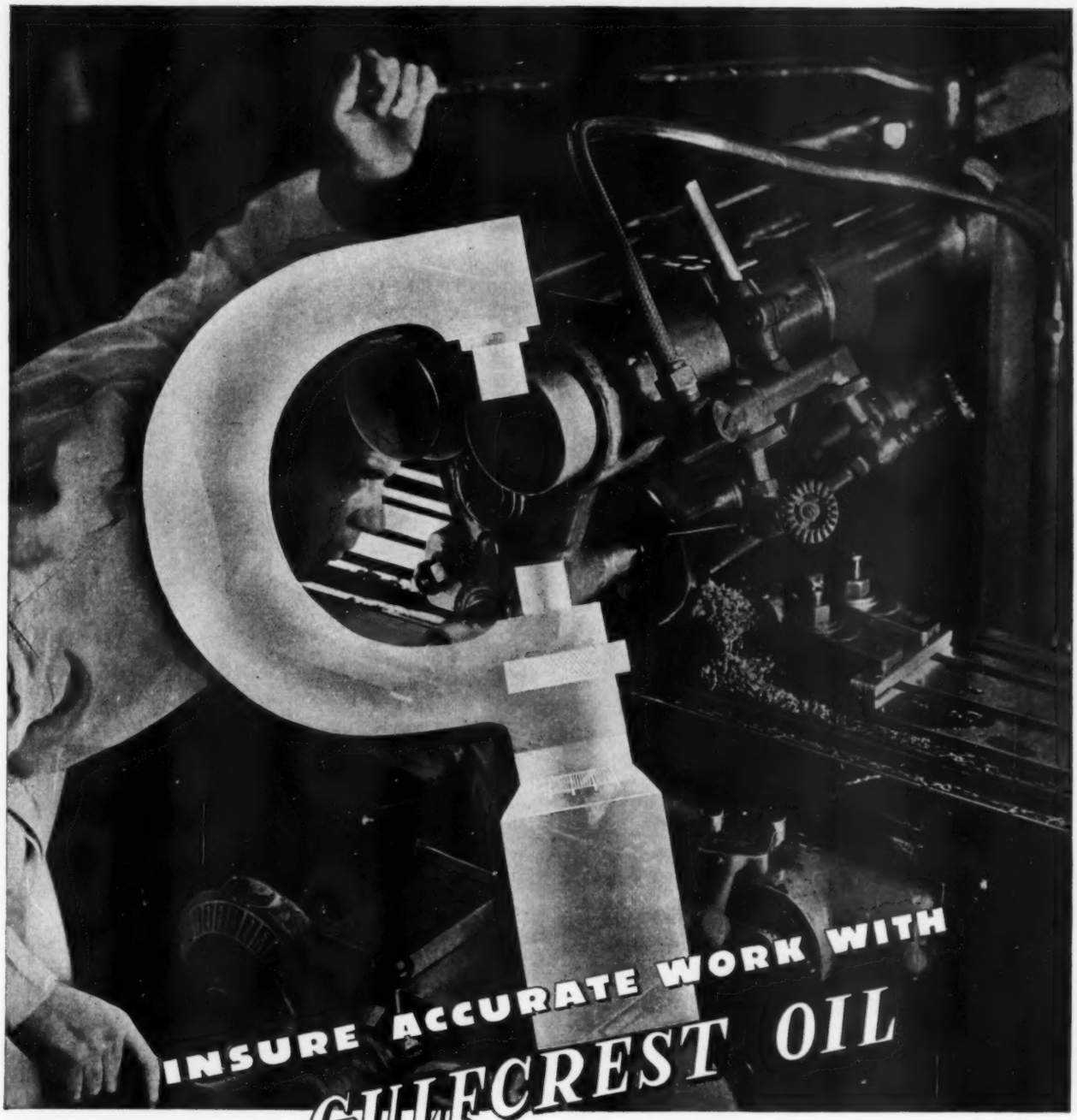
Famous World Travellers



From this battery of finishing rolls, Alcoa Aluminum strip sheet is shipped far and wide to be made into thousands of different products. Manufacturers and users everywhere profit because of these properties of Aluminum; light weight, resistance to corrosion, strength to suit the use, ease of fabrication, and adaptability to a variety of finishes.

Familiar to picture takers the world over are the famous products shown here. Aluminum is an important contributor to reasons for their popularity. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Bldg., Pittsburgh, Pa.

ALCOA · ALUMINUM



"We must avoid wear in the spindle bearings of this milling machine — for inaccuracy in the bearings would mean inaccuracy in the work. So we use the best oil we can get — Gulfcrest Oil," says the manager of this plant. (Gulfcrest is refined by the same exclusive Gulf process as Gulfpride, the World's Finest Motor Oil.)

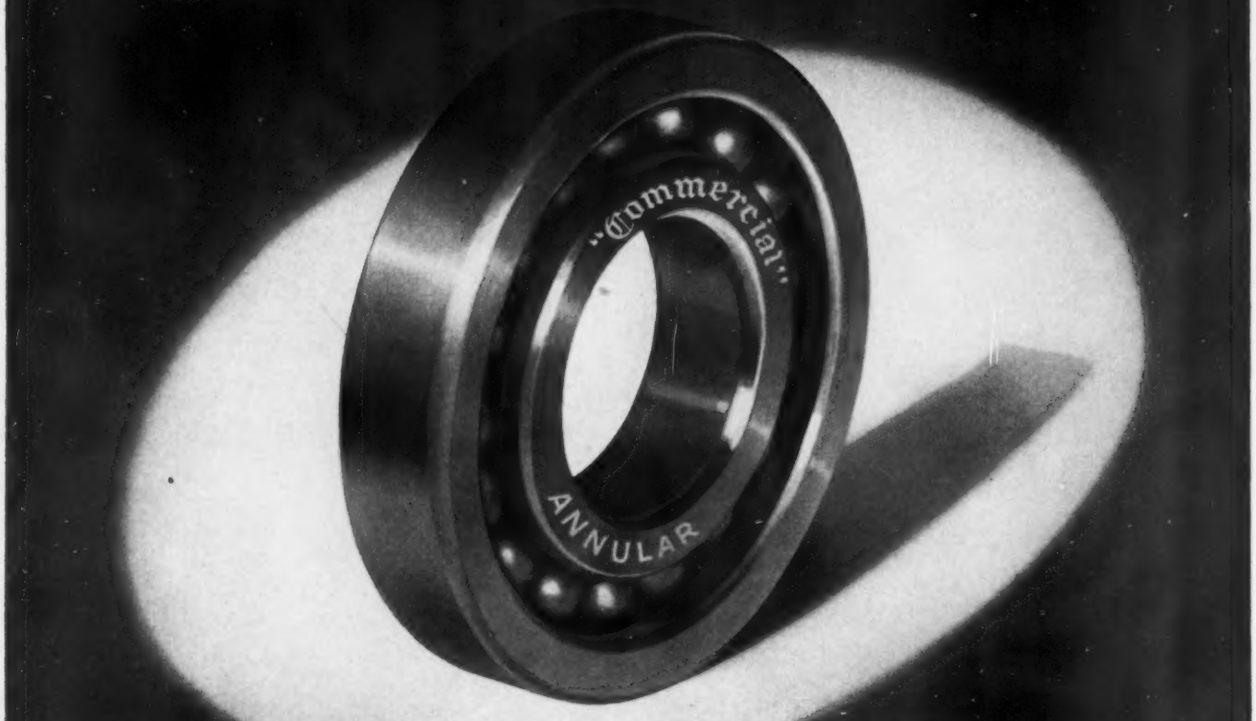
After you make a substantial investment in precision machinery, isn't it good business to protect it with the best lubricants available? The cost of the highest quality oil is trivial when it is considered that proper lubrication is vital to efficient operation and continuous production.

In Gulf's complete line of 553 quality oils and greases, are lubricants exactly suited to the requirements of each and every machine in your plant. Let a Gulf engineer recommend proper lubrication practice for your equipment. He can help you effect long range economies which will show up on the profit side of the ledger.

Gulf Oil Corporation GULF INDUSTRIAL LUBRICATION **Gulf Refining Company**

GENERAL OFFICES: GULF BUILDING, PITTSBURGH, PA.

QUALITY PERFORMANCE



"Commercial"
ANNULAR BALL BEARINGS

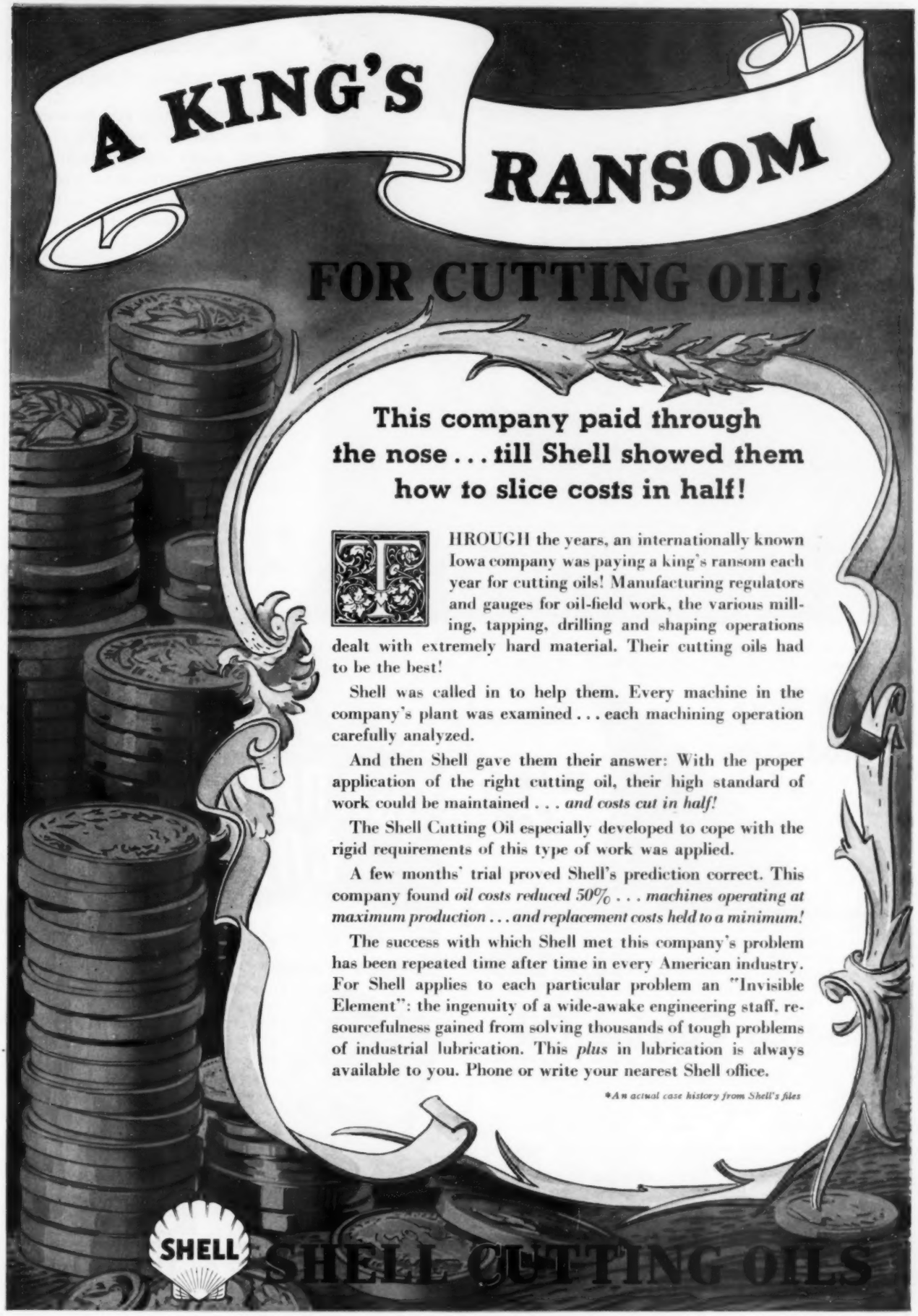
"Commercial" ANNULAR BALL BEARINGS are built in a large and splendidly equipped plant manned and directed by bearing experts . . . . men who *know* bearings and how to make them. The Quality of these bearings begins with the selection of steels — tough, high grade steels, carefully heat-treated to withstand over-loads, side thrusts, high speeds and unusual shocks and strains. Every process in the manufacture of "Commercial" ANNULAR BALL BEARINGS is carefully supervised with frequent tests and inspections.

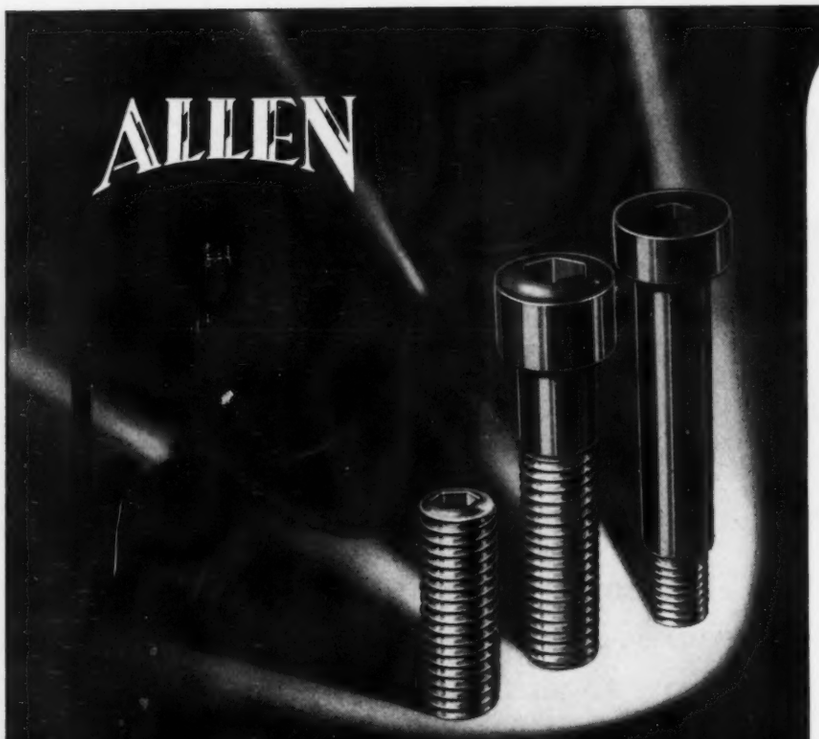
When you use these bearings in your plant machinery or in your product, you are definitely assured of efficient bearing performance. The demand for "Commercial" ANNULAR BALL BEARINGS increases day by day, year by year. There can only be one reason for this nation-wide acceptance . . . . *better bearings at a moderate price.*

If you would like to know more about "Commercial" ANNULAR BALL BEARINGS; if you would like to know how they cut bearing costs, write for catalog and price list.

THE SCHATZ MANUFACTURING CO.
POUGHKEEPSIE, N. Y.
Detroit Sales Office: 2608 Book Tower
Chicago Sales Office: 120 N. Peoria St.
Cleveland Sales Office: 402 Swetland Bldg.

SPEEDS UP TO 2500 R. P. M. • DUAL-THRUST CAPACITY • SELF-CONTAINED


A KING'S RANSOM
FOR CUTTING OIL!
This company paid through the nose . . . till Shell showed them how to slice costs in half!
THROUGH the years, an internationally known Iowa company was paying a king's ransom each year for cutting oils! Manufacturing regulators and gauges for oil-field work, the various milling, tapping, drilling and shaping operations dealt with extremely hard material. Their cutting oils had to be the best!
Shell was called in to help them. Every machine in the company's plant was examined . . . each machining operation carefully analyzed.
And then Shell gave them their answer: With the proper application of the right cutting oil, their high standard of work could be maintained . . . *and costs cut in half!*
The Shell Cutting Oil especially developed to cope with the rigid requirements of this type of work was applied.
A few months' trial proved Shell's prediction correct. This company found *oil costs reduced 50% . . . machines operating at maximum production . . . and replacement costs held to a minimum!*
The success with which Shell met this company's problem has been repeated time after time in every American industry. For Shell applies to each particular problem an "Invisible Element": the ingenuity of a wide-awake engineering staff, resourcefulness gained from solving thousands of tough problems of industrial lubrication. This *plus* in lubrication is always available to you. Phone or write your nearest Shell office.
*An actual case history from Shell's files
SHELL
SHELL CUTTING OILS



Biggest little things in machine design

By their very nature and manner of use, hollow screws are a product of stout integrity and in their manufacture ALLEN considers only the *best way* — the way we would make them if we alone used them:—

Cold-drawing and heat-treating special alloy steels;

Accurately threading on lead screw threading machines;

Instrument-testing each lot for strength and toughness;

Hand-inspecting each screw for visual imperfections.

The result invites test of HOLDING-POWER in your newer, more compactly designed machines. *Samples* — in sizes and styles specified — free.

THE ALLEN MFG. COMPANY
HARTFORD, CONN. U. S. A.

Get More Production at Less Cost

Safco Koldkut Cutting Oil enables metal cutting machines to operate at greater speeds, and to produce more work between tool grinds. It increases the efficiency of the operator, as less time is taken for tool grinding and resetting. And it gives a better finish.

Safco Cutting Oil

gives better machine bearing life, too, as there is no accumulation of free sulphur or mineral acids in the bearings. Therefore machines deliver greater accuracy of work, because close clearance bearings on automatics, gear cutters, etc., are not impaired.

On alloy steels, nickel "molly", chrome "molly", and various grades of *stainless steel*, Safco is solving the production problem.

Order a trial drum on a satisfaction guaranteed basis. It will solve *your* problem. Write for booklet.

Swan-Finch Oil Corporation
R.C.A. Building, West, New York, N. Y.
Chicago Buffalo Detroit

Announcing
OUR NEW GENERAL CATALOG

Your copy of the new GITS lubricating equipment catalog, • • • illustrating and describing many new features, is now ready for mailing. Over 1,000 styles and sizes of oil cups, including oil and grease seals, oil cans, gauges, etc. are shown.

oil cups • oil and grease seals • oil cans • gauges

GITS BROS MANUFACTURING CO.
1857 S. KILBOURN AVE., CHICAGO

FINE CRAFTSMANSHIP FOR *Custom Made* QUALITY

Behind every fine product is a story of long experience, careful development and acquired skill. So it is with Ludlum steels, the product of 83 years of metallurgical progress, modernized methods and trained craftsmanship.

Whether the steel you need is a stock item or a special analysis, the one recommended by Ludlum will meet your requirements *exactly*.

Ludlum fits the steel to the job for manufacturers who are seeking higher production and reduced time losses. A typical saving was effected for a Maryland customer on seaming rolls for cans used to pack tomato juice. In place of the case hardened steel formerly used, a Ludlum alloy of high resistance to wear and distortion was substituted. The new rolls ran for 40 days on 2,858,444 cans—*nearly three times* the run obtained with case hardened steel—and freedom from corrosion was also secured.

Without obligation, refer *your* problems to Ludlum . . . Just drop a line to Research Department, Ludlum Steel Company, 1006 C Street, Watervliet, N.Y.

LUDLUM

FINE STEELS SINCE 1854

TOOL · STAINLESS · CARBON · ALLOY

PERKINS

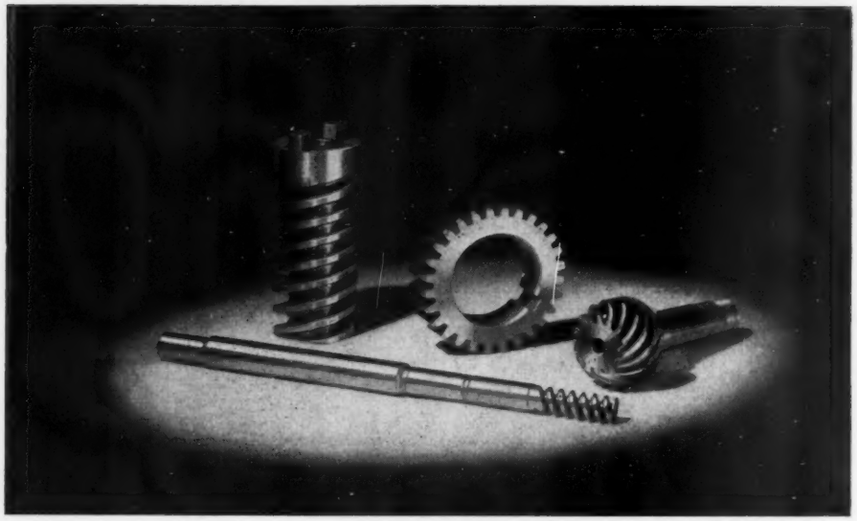
Hardened and Ground-Thread Worms are big Money-Savers

Many instances are on record where customers formerly using a shell-type worm have saved big money by changing to a Perkins hardened and ground-thread worm, made integral with the shaft.

Besides reducing assembling costs, this integral construction also eliminates assembling errors, thereby assuring more uniform quality in the finished product.

We make all types of worm, helical, spiral, bevel and worm gears to meet the buyer's specifications; and our engineers are always glad to cooperate in developing special designs which will give the utmost efficiency and economy.

Write us regarding any present or prospective gear requirement.



PERKINS MACHINE & GEAR CO., 130 Circuit Ave., Springfield, Mass.

A
Special
Rack
by
STAHL
This rack was made up with 199 teeth around the periphery.
Requirements called for correct spacing, as well as holding pitch lines to correct width on both sides and ends.
Masters and layout were made by the Stahl Engineering Department. Two sets were made and the accuracy came within the limits called for.
When you need gears — standard, special, large or small—you can get them quickly by coming to Stahl.
STAHL GEARS

THE STAHL GEAR & MACHINE CO.
CLEVELAND OHIO

GEARS

Spur - Helical - Bevel - Worms - Screws - Racks
Gear Hobbing - Thread Milling - Broaching

THE ADAMS COMPANY (*Est. 1883*) 1900 Bridge St. Dubuque, Iowa

GEARS—GOOD GEARS ONLY
ALL KINDS
At the Right Price
THE CINCINNATI GEAR CO.
CINCINNATI, OHIO

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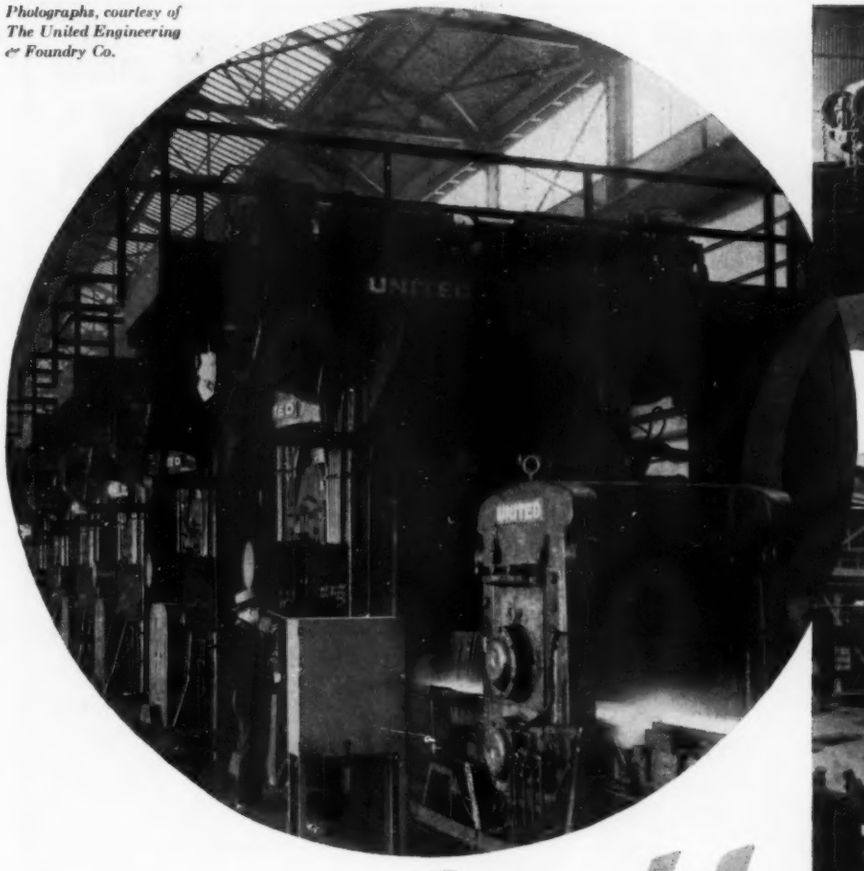
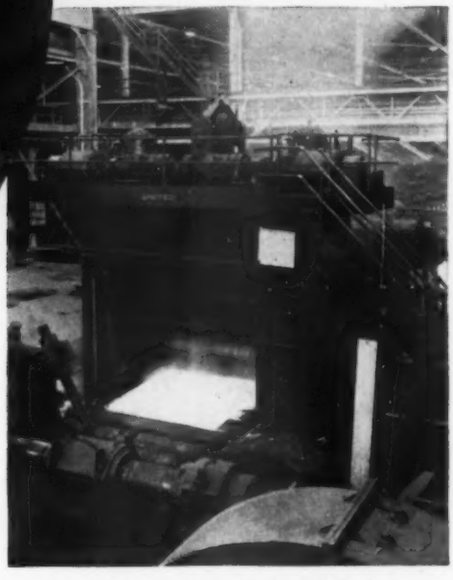
Cut Spur, Bevel and Worm Gears
All sizes. Every description. Operating Machinery for Bridges, etc. "Les Simplex" Cold Metal Saws.

GEARS - WORMS - CAMS - MADE TO ORDER
HARTFORD GEARS
THE HARTFORD SPECIAL MACHINERY CO., Hartford, Conn.

Photographs, courtesy of The United Engineering & Foundry Co.



Four D.O. James Heavy Duty Worm Gear Reducers, size 357DW, ratio 1426 to 1, operating rotary coil pickler.



Large broadside mill equipped with D.O. James Reducers and Gears.

Big Stuff

126 D.O. James small worm gear reducers are very important parts of this continuous hot and cold strip mill... and this truly is, as we say, "*Big Stuff*."

For 50 years, the D. O. James Manufacturing Company have been making all types of gears and speed reducers, and whether it be "Big Stuff" or just one gear, we invite your inquiries.

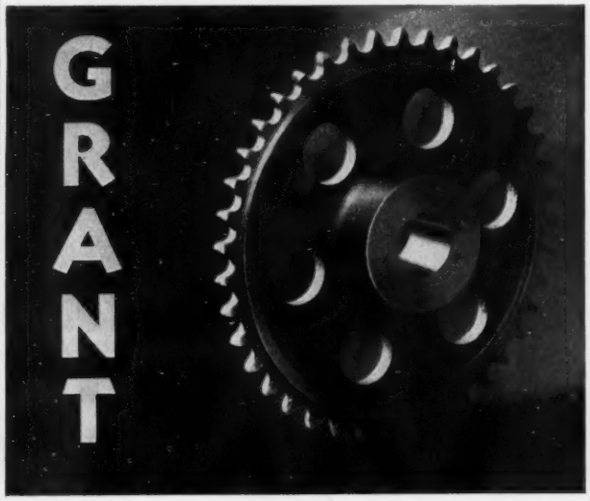
A thoroughly trained office and plant personnel welcome the opportunity of serving you. May we?

Rotary flying shear for a Russian steel mill. D. O. James Gears were used exclusively.

D. O. JAMES MANUFACTURING COMPANY, 1120 WEST MONROE STREET • CHICAGO, ILLINOIS

D.O.JAMES

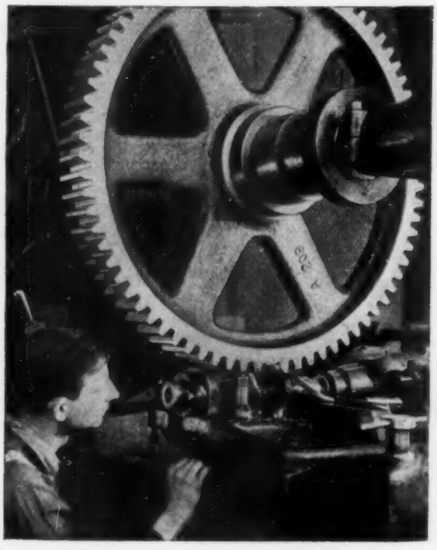
FOR FIFTY YEARS—MAKERS OF EVERY TYPE OF SPEED REDUCER AND CUT GEAR



Sixtieth GRANT YEAR 1877-1937

Whether your drawings call for either special gears or stock gears, you will find complete satisfaction if you specify GRANT.

GRANT GEAR WORKS • Boston



THE FINEST GEARS ARE KNOWN BY THIS MARK

For more than 40 years the name "Phillie Gear" has stood for the best in gears. Highest quality material, expert workmanship, plus careful supervision by power transmission engineers assures a continuance of this reputation. Our policy is our guarantee of satisfactory gear performance.

PHILLIE GEAR

Write for complete Catalog

PHILADELPHIA GEAR WORKS

Industrial Gears and Speed Reducers

Erie Ave. and G. St., Philadelphia

—in the smaller range— having made MILLIONS of them, we know the tricks

Gear Specialties

INCORPORATED

2635 W. CANTON STREET • CHICAGO

For 20 years this Company has been known as Mechanical Specialties Mfg. Co

UNIVERSAL STANDARD DRILL BUSHINGS

MADE TO A. S. A. SIZES

LOWEST COST -:- LONGEST LIFE

UNIVERSAL ENGINEERING CO.

FRANKENMUTH, MICHIGAN

GEARS

• Spur • Helical • Worm • Bevel or Special Gears

Grinding, Surface, Internal, External, Lapping We do splining and broaching, also. 25 years of serving the machine trade guarantees you of our quality of work, and prompt service.

We solicit your inquiries.

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MP SPECIALISTS . . . not jacks of all trades! MP

To do one thing *perfectly* rather than many things well is the sole objective of every MEISEL gear. And being constructed with only the requirements of a specific job in mind, MEISEL gears function at maximum efficiency always. Whatever your gear problem, investigate the advantages of *specifically* engineered gears by MEISEL.

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Spur—Speed Transformers—*Worm*

All Types of Cut Gears 4-Speed Positive Drive Reducer Silent Laminated Steel Pinions

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SMALL GEARS

ALSO MEDIUM SIZES IN ALL TYPES AND MATERIALS

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Massachusetts Gear & Tool Company

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SILENT
FORMICA GEARS

for Many Purposes

FORMICA gears are popular because they make quiet machines possible. That helps machinery salesmen, and helps even more the maintenance man who is expected to keep machinery running smoothly and sweetly. When they are properly cut in the right sizes Formica gears will outwear metal. They interpose an elastic member in the drive which absorbs shocks and saves the machines. Any of the gear cutters named can provide Formica gears for maintenance or production purposes.

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The Akron Gear & En'g Co.
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Gear Specialties, Inc.
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Worcester Gear Works
Worcester, Mass.

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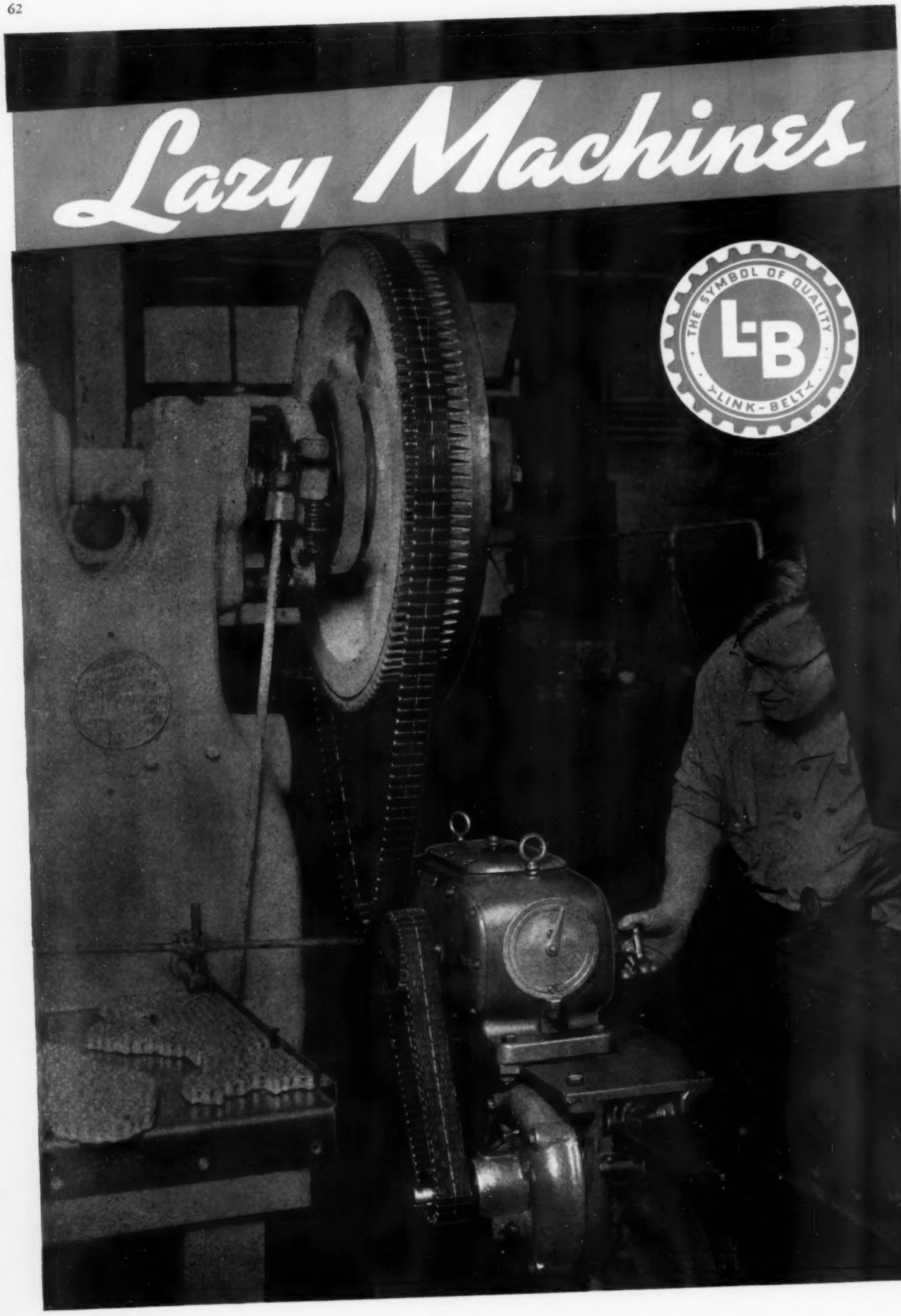

Lazy Machines
THE SYMBOL OF QUALITY
LB
LINK-BELT

are Sneak Thieves..

BRING THEM UP TO FULL RATED CAPACITY WITH LINK-BELT POSITIVE DRIVES

● Machines are not, of course, actually lazy. But unless their output is equivalent to their full rated capacity, it amounts to the same thing — you are being robbed of production . . . profits.

Frequently the fault lies, not in the machine, but in the power transmitting medium. Drives that slip and jerk, fail to deliver full R.P.M. They render uniformity of product-quality uncertain.

Replacing inefficient drives with Link-Belt positive drives results in important output increases. By delivering the full power of the motor, in a smooth-flowing stream, machines produce at rated capacity.

Link-Belt makes all seven types of positive drives, and can thus recommend the correct drive for any application. Whether you suspect any of your machines of being lazy or not, find out what a Link-Belt Positive Drive Specialist has to suggest.

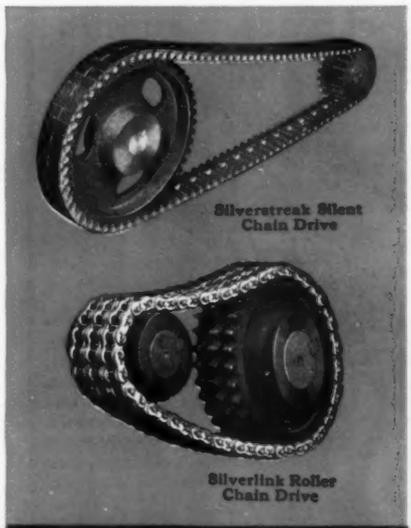
LINK-BELT COMPANY

The Leading Manufacturer of Positive Power Transmitting Equipment

INDIANAPOLIS PHILADELPHIA CHICAGO ATLANTA SAN FRANCISCO TORONTO

Baltimore, Boston, Buffalo, Cleveland, Dallas, Denver, Detroit, Grand Rapids, Kansas City, Mo., Los Angeles, Louisville, Minneapolis, New Orleans, New York, Oakland, Calif., Pittsburgh, Portland, Ore., Seattle, St. Louis, St. Paul, Wilkes-Barre, Montreal, Vancouver. 7168

POSITIVE VARIABLE SPEED CONTROL



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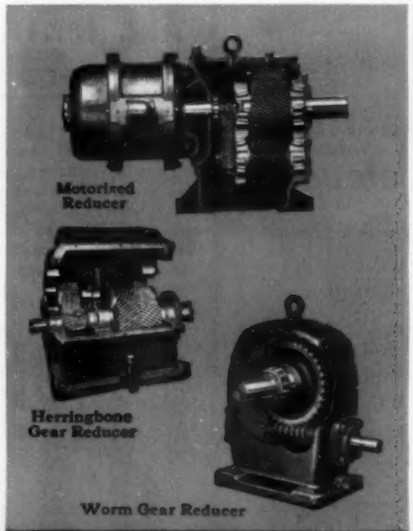
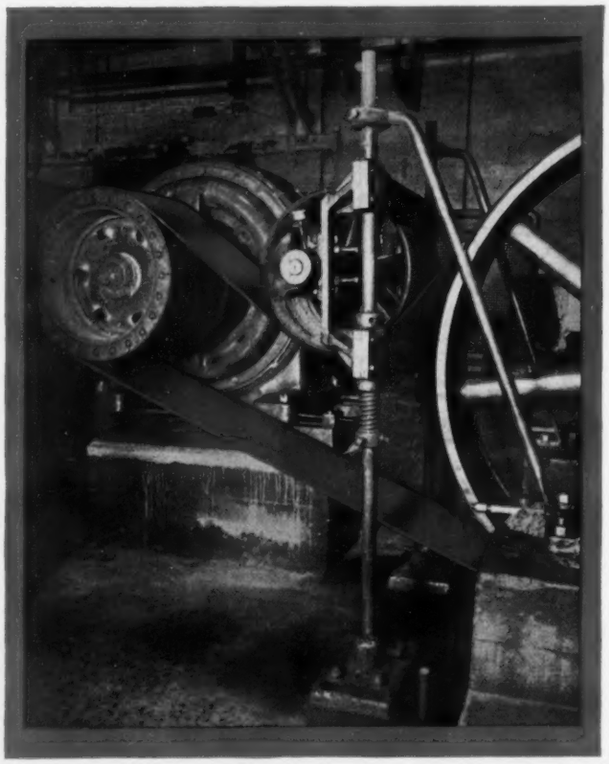


POSITIVE SPEED REDUCTION

SEND FOR THIS BOOK

8 complete catalogs bound as one book—covering the complete line of Link-Belt positive drives. Ask for Binder No. 2100. Also send for catalog covering the complete line of Link-Belt power transmission units such as anti-friction and babbitted bearing pillow blocks, clutches, couplings, take-ups, pulleys, gears, etc.

RHOADS TANNATE LEATHER BELTING



GIVES YOU LONGER SERVICE

If your drive must be an idler drive, Tannate is the economical belt to use. Its great strength and extreme flexibility assure a long service-life even when running under an idler. On the drive shown, 18 months was the usual belt life before Tannate was installed. The Tannate has been on four and a half years and is still good, still giving excellent service and much satisfaction.

With most short center drives when a change is made from ordinary belting to a Tannate Belt the idler may be discarded as the unusal power-transmitting capacity of Tannate Belts carries the load without an idler. There are occasions, though rare, when a drive seems to require an idler even with a Tannate Belt, in such cases the flexibility and durability of Tannate can save you much trouble and greatly reduce your maintenance and replacement costs.

Many users consider Tannate a "necessity" for hard drives and highly economical on a wide range of drives not usually so classed.

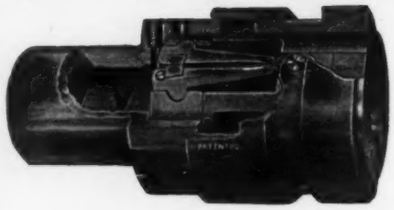
Why not give Tannate Belts a trial on your drives under the Rhoads Service Guarantee?

J. E. RHOADS AND SONS

PHILADELPHIA, 35 N. SIXTH STREET
NEW YORK, 102 BEEKMAN STREET
CHICAGO, 26 N. CLINTON STREET
ATLANTA, 88 FORSYTH STREET S. W.
CLEVELAND, 1200 W. NINTH STREET

Factory and Tannery, Wilmington, Del.

THE JOHNSON FRICTION CLUTCH



Single Clutch showing working parts.

. . . for sensitive starting and instantaneous release

Every requirement for smooth, quiet clutch action is met in the JOHNSON CLUTCH.

Starting is smoother and faster—releasing is instantaneous with a gradual stop.

These units—the product of a pioneer in clutch design and development—can be depended on to meet any conditions, usual or unusual. They are available in types and sizes for all kinds of drives.

Call on our engineers to help you select the proper clutch for the job. It will mean better performance, and longer service at lower cost. Send us details of your drive and we'll gladly offer recommendations for handling it efficiently and effectively.

MODERN GROUP DRIVE PTC

Write for Blue Clutch Catalog No. 101

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN

Titeflex

REG. U.S. PAT. OFF.

ALL METAL FLEXIBLE TUBING

Stays Permanently Tight

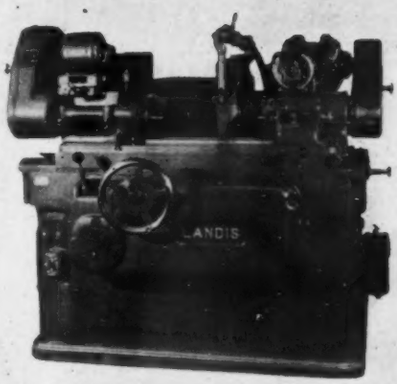
This improved type metal hose is flexible under all conditions without relying on packed sliding joints. It is widely accepted for machine tool and automotive applications because of its efficiency and dependability under all conditions.

TITEFLEX is ideal for carrying steam, oil, grease lubricating, cutting compounds and air under high pressure. Ask TITEFLEX Engineers to give you the benefit of their experience. Send for a copy of Catalog 109.

TITEFLEX METAL HOSE CO.

494 FRELINGHUYSEN AVE. NEWARK, N. J.

SKF-EQUIPPED FOR PERFORMANCE AND PROFITS!



• If you would scan the list of manufacturers and users of SKF-equipped machine tools, it would read like the blue book of leaders in the machine tool industry.

SKF produces bearings for every antifriction need in the machine tool industry. For heavy duty or light, high-speed work; where thrust and severe service call for continuous operation; where the ability to insure rigidity and to operate with practically no change in temperature are the things that count, there you will find SKF Bearings.

Making a wider variety of bearing types and sizes than any other manufacturer in the world, SKF is well qualified to put the right bearing in the right place—always. SKF Industries, Incorporated, Front Street & Erie Avenue, Philadelphia, Pennsylvania.

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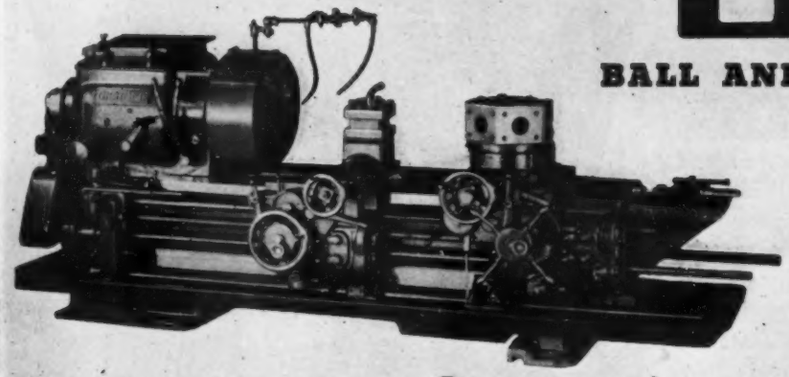

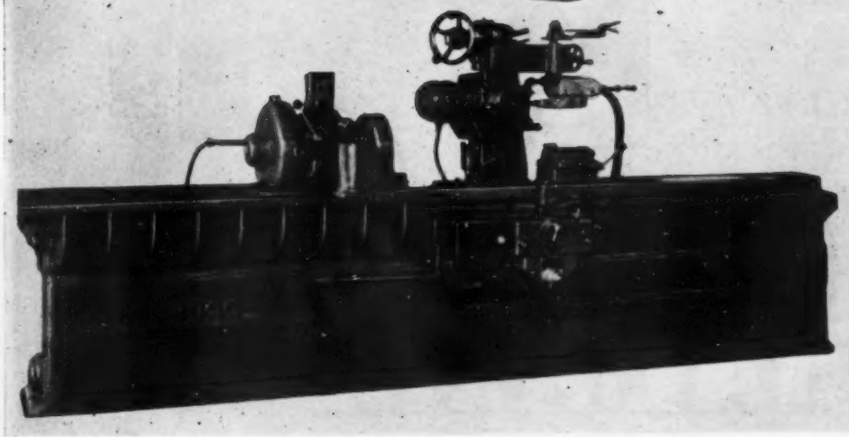

SKF

BALL AND ROLLER BEARINGS

More than 200 machine tool manufacturers select SKF Bearings for precision, long life, and minimum maintenance.

Have you a substitute for EXPERIENCE?

We haven't, and we don't believe there is any. Our experience in building multiple V-Belt drives covers the whole range from 1/4 hp. to 2000 hp. The engineering refinement necessary to build a 1/4 hp. drive, and the engineering ability and manufacturing facilities necessary to build a 2000 hp. drive, combine into a diversified breadth of experience which is built into every Texrope Drive.

Allis-Chalmers originated, developed and pioneered the multiple V-Belt drive principle, and has conceived and developed all its improvements and variations such as the Duro-Brace and Vari-Pitch Sheaves and the Straitline Automatic Ball Bearing Motor Base. When you buy Texrope Drives you are buying drives that have resulted from vast experience and are produced by the most complete and up-to-date manufacturing facilities.

Before buying a multiple V-Belt drive consult multiple V-Belt headquarters—Texrope Division, Allis-Chalmers Manufacturing Company.

Write for Vari-Pitch Bulletin No. 1261-A and Duro-Brace Bulletin No. 2188-B

Belts by Goodrich

TEXROPE DIVISION

ALLIS·CHALMERS

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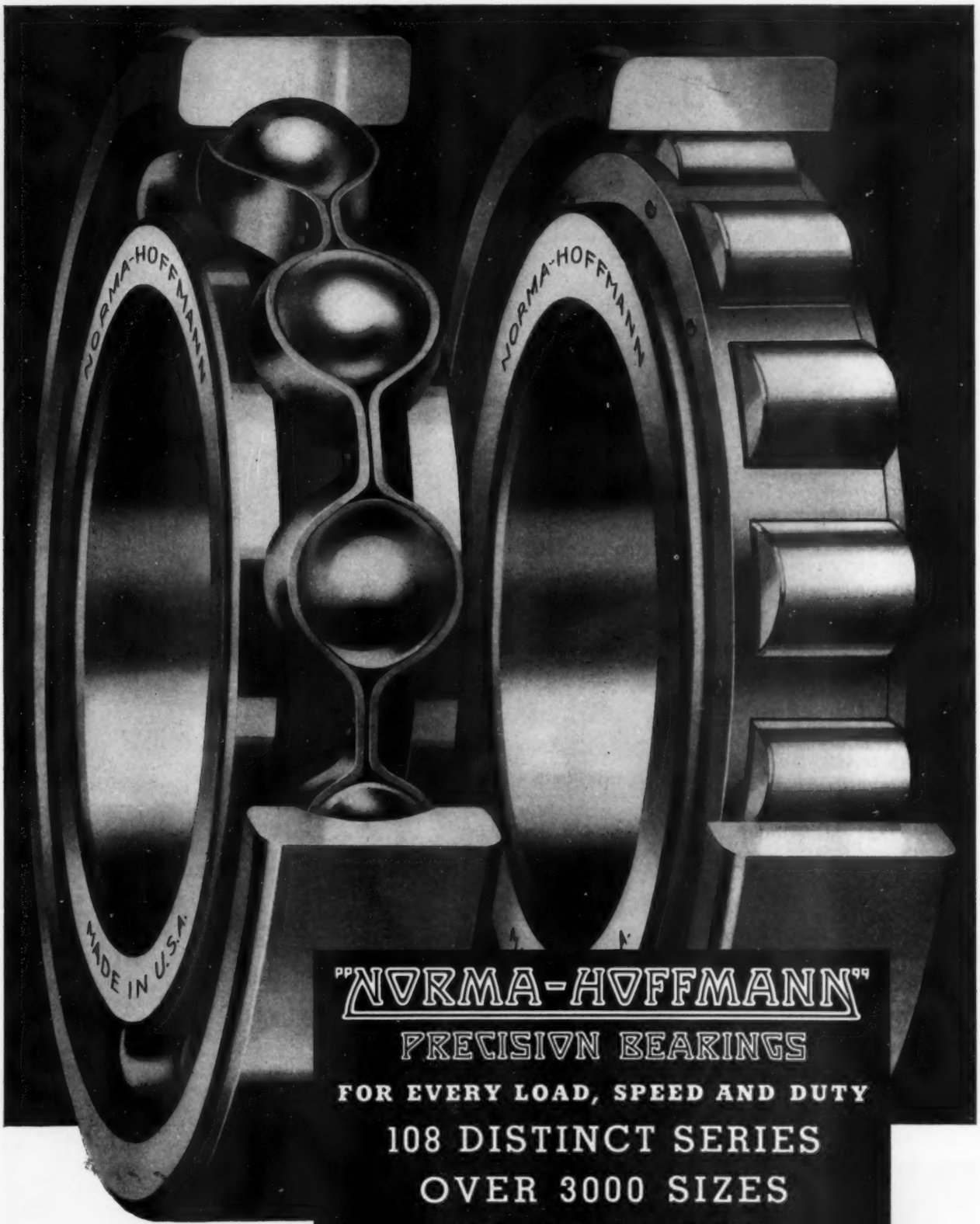


"NORMA-HOFFMANN"

PRECISION BEARINGS

FOR EVERY LOAD, SPEED AND DUTY

108 DISTINCT SERIES

OVER 3000 SIZES

BALL, ROLLER AND THRUST

⅛" to 21" Bore—Metric and Inch Sizes

Write for the Catalog and Engineering Counsel

NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN., U.S.A.

No Other V-Belt compares with Dayton for

Undaunted Toughness

No rhinoceros ever boasted a hide to match the toughness of the Dayton Cog-Belt. The rubber compounds in Daytons are the toughest materials used in belt making, and the fabrics are the strongest. That's why Daytons have the stamina to stand up on the most grueling jobs.

In mines and quarries, in lime and cement mills, in the oil fields . . . wherever belts are exposed to dust and grit, dampness and drought . . . Dayton Cog-Belt Drives by the tens of thousands are surpassing all others in ruggedness and long life.

If you want sturdy, dependable, economical power transmission . . . smooth, silent, shockless power transmission . . . install Dayton Cog-Belts. Write us for catalogs and data, or call your local Dayton distributor.

THE DAYTON RUBBER MFG. CO.
DAYTON, OHIO

Dayton
COG-BELT DRIVES

MADE BY THE WORLD'S LARGEST MANUFACTURER OF V-BELTS

Presenting

THE PROCUNIER

UNIVERSAL

TAPPING MACHINE

featuring

Five tapping speeds—385, 600, 935, 1450 and 2240 R.P.M.

Preset tapping and reversing pressures, maintained accurately uniform by long helical springs—independent of operator.

Capacity from No. 8 to 5/8" using two interchangeable heads.

Automatic lubrication of tap while cutting only, with flexible timing and volume adjustments.

Procunier Tru-Grip Tap Holder.

Procunier Sensitive High Speed Tapping Heads.

Precision hand-screw height adjustment of working table.

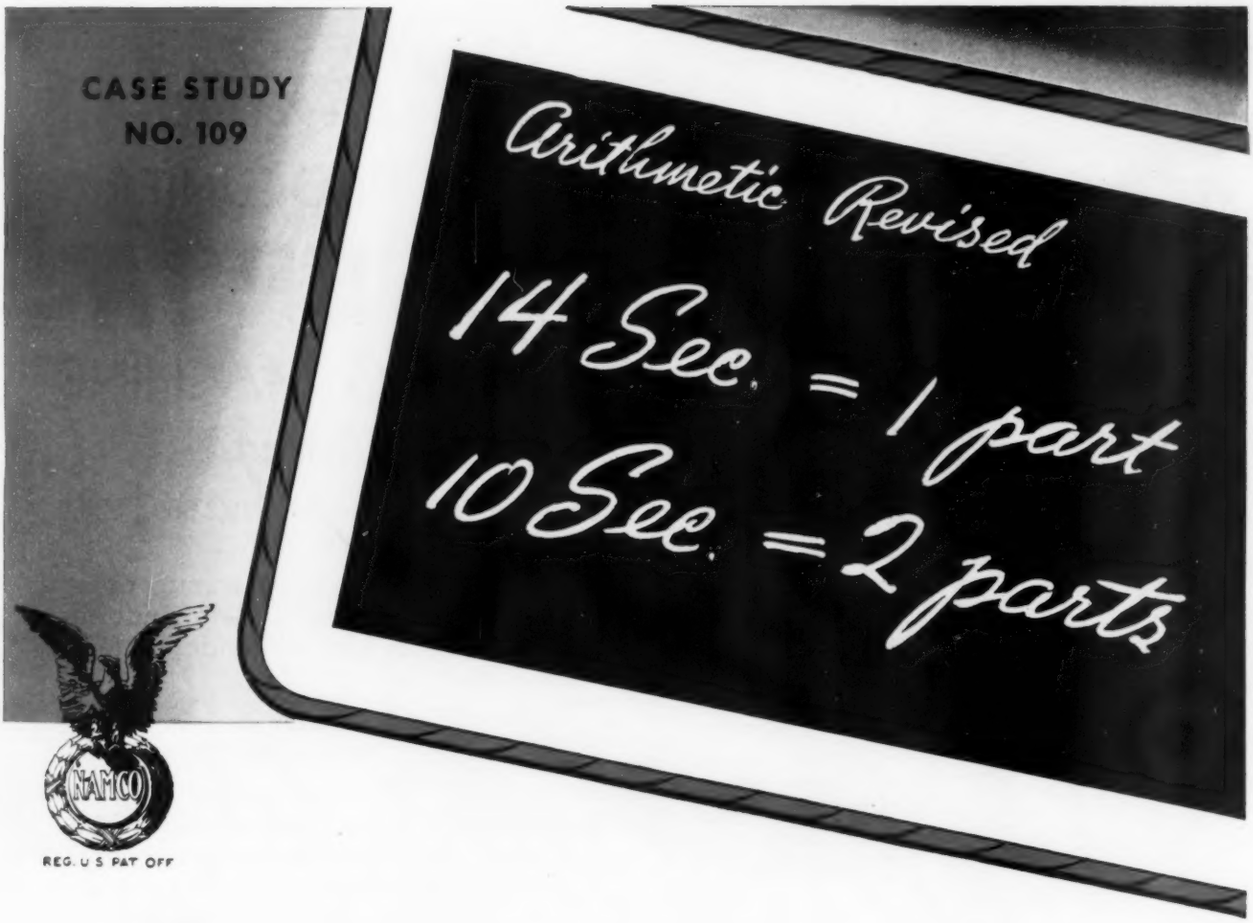
Precision depth-stop adjustment with 1/32" graduated indicator.

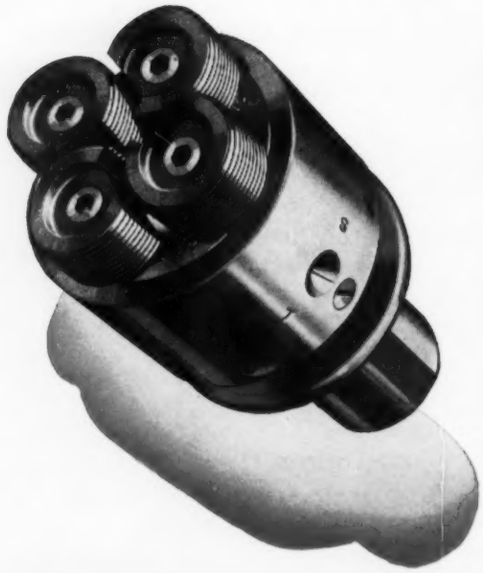
Whether your tapping requirements demand greater flexibility, higher production, increased accuracy or maximum capacity range, the Procunier Universal offers matchless value.

Write Today for Catalog and Complete Information.

PROCUNIER SAFETY CHUCK CO.

14 South Clinton Street CHICAGO



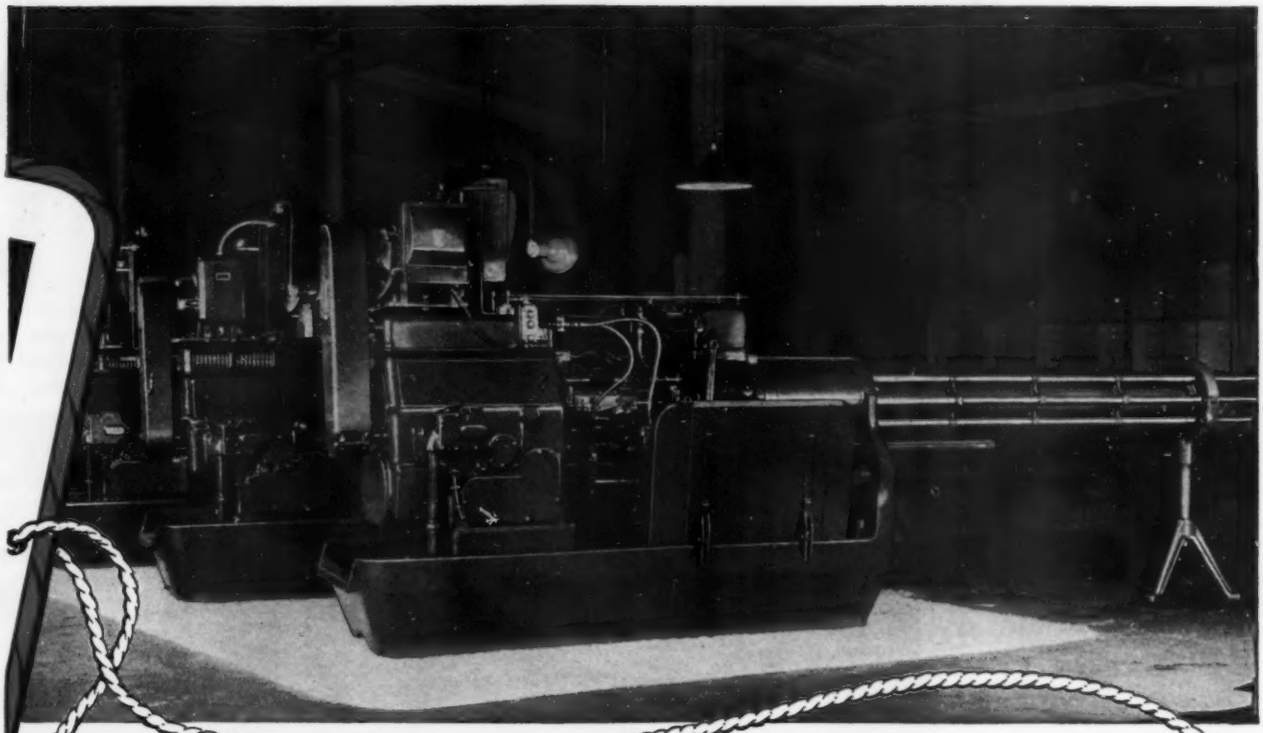


Cut Your Thread-Cutting Costs the NAMCO Way

● Our new Self-Opening Die Heads and Circular Chasers are cutting costs in many of America's largest plants. These tools provide smoother, more accurate threads—at a 10% greater cutting speed. The chasers have 10 times the cutting surface, 10 times the life of hobbed and tapped types. You can produce more threads per grind and many more grinds per chaser. Write us for actual case histories on *your* type of work.

Automatic Screw Machines
Dies and Taps
Positive Centrifuges
The Chronolog
Contract Manufacturing

NATIONAL



"These Machines Will Pay for Themselves in 18 Months"

— Defiance Automatic Screw Co.

The figure for the production of a given automotive part at the Defiance Automatic Screw Co. plant at Defiance, Ohio was 14 seconds for one part. That was standard.

Three National Acme Gridley 6-spindle automatics were installed. Then they had to revise their arithmetic. The new figure is 10 seconds for *two* parts. Which means a production speed almost three times greater.

There are other advantages, too. These machines operate at better than 80% efficiency. Finish and accuracy are excellent. Maintenance costs are negligible. Set-up time is reduced. Tool life lengthened. And, plant officials say, the machines will pay for themselves in 18 months.

If your automatic screw machines are more than a few years old, you can make comparable production increases and cost savings in your plant.

Why not plan now to get all the benefits of the new model Acme Gridleys? Get extra power, higher spindle speeds, simplified tooling, greater versatility. Let one of our field engineers make estimates of costs and savings.

The National Acme Company, Cleveland, Ohio

ACME GRIDLEY AUTOMATICS

BARNES

HYDRAULIC EQUIPMENT

PISTON
FEED
PUMP

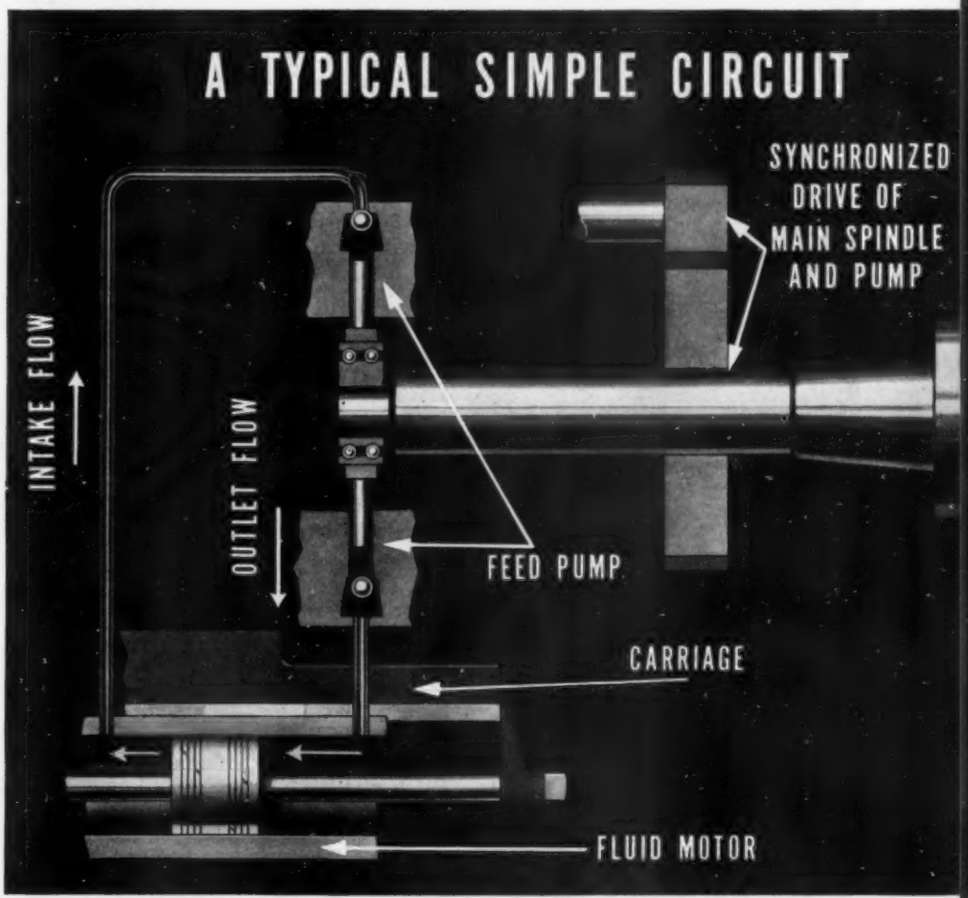
Patented System of Hydraulic Transmission and Control

The group illustration on the opposite page shows some of the machines actuated by the Barnes System of Hydraulic Transmission and Control which is fully covered by United States and Foreign Patents. This System is simple, accurate, and dependable. Its application to machine tools simplifies the combination of machine elements by greatly reducing the number of working parts and permits an unusually rigid structural arrangement. Its operation requires a minimum amount of skill and effort of the attendant and provides a coordination of machine elements which makes it positively fool proof. Further, its life without need of repairs is longer than common mechanical structures.

Briefly, the Barnes Patented System of Hydraulic Transmission and Control consists of four units or operating mechanisms:—(1) an hydraulic actuator, (2) a piston pump which imparts a uniform feeding speed to the actuator, (3) a rapid traverse pump which provides rapid traverse to the actuator, (4) a shiftable control mechanism to direct fluid from the piston pump to the actuator independently of the rapid traverse pump mechanism. Most important of these is the piston pump that is illustrated and described in a new bulletin which will be sent promptly on request to interested engineers, designers, and other executives.

A TYPICAL SIMPLE CIRCUIT

In applications of hydraulic power, fluid circuit and drive of feed pump are the most important factors. Illustrated at right is a typical simple circuit in which the variable feed pump displaces fluid through the outlet conduit to one end of the fluid motor and simultaneously an equal amount of fluid is expelled and returned to the feed pump. Thus it is apparent that the feed pump serves as a fluid generator for 180° and as motor or actuator during remaining 180° of its complete revolution. Pressure of the fluid within conduits, the pump structure and the fluid motor is in direct relation and in synchronism with feed fluctuation between cutter and machined surface. Direction of the fluid flow is under positive control and may be reversed by directing fluid to either side of the fluid motor piston. Details of direction control such as a valve or other like structures, and other important features of the Barnes Patented System of Hydraulic Transmission and Control will be found in a series of pamphlets now in preparation. Write today for complete information.



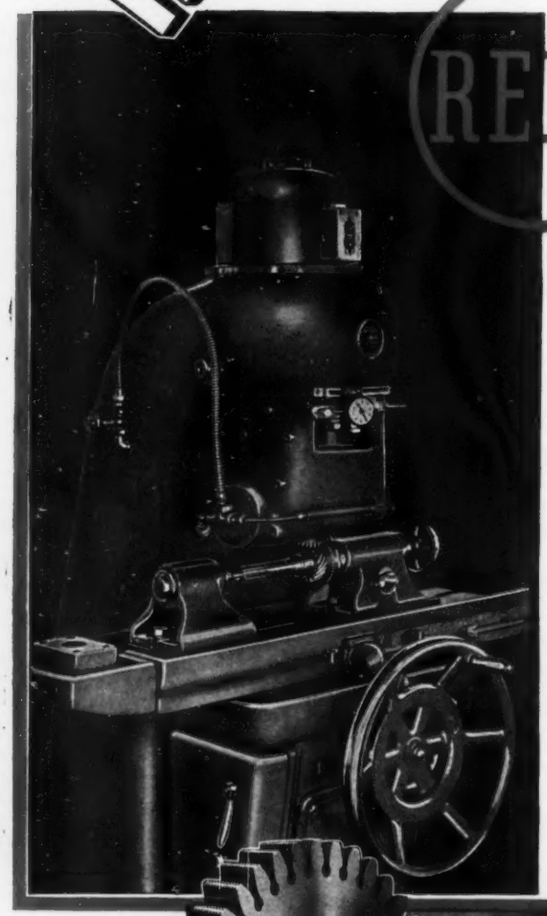
THE BARNES PATENTED HYDRAULIC STRUCTURE IS MANUFACTURED AND SOLD EXCLUSIVELY BY

W. F. and JOHN BARNES CO.

ROCKFORD, ILLINOIS, U. S. A.

REDUCE GEAR FINISHING TIME TO SECONDS

RED RING ROTARY CROSSED AXIS GEAR SHAVING MACHINE

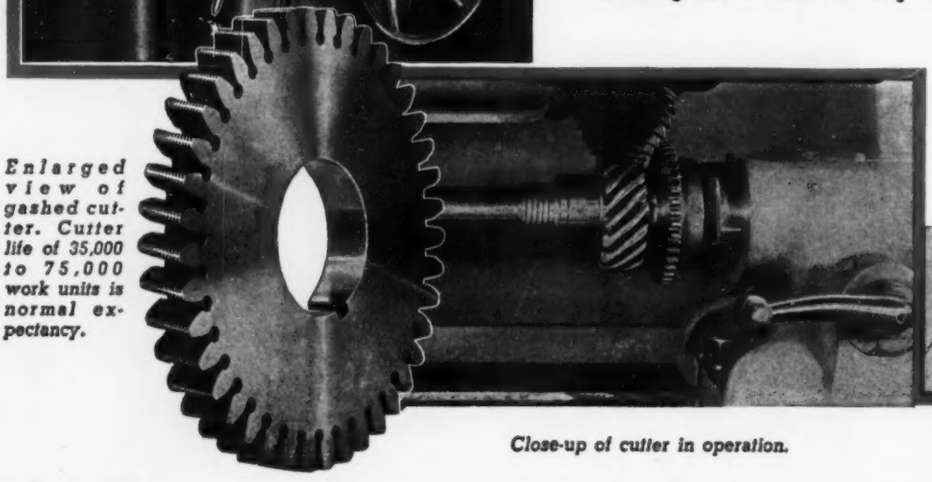


Higher speed . . . better finish . . . characterizes the work of the Red Ring Gear Shaving Machine. It will finish a 20 tooth gear, 9.25 pitch, 20° pressure angle, 35° helix angle, in 20 to 40 seconds floor to floor, depending on the stock to be removed. Other gears are handled with corresponding speed.

Profile . . . index . . . eccentricity . . . and helix angle are corrected to high precision. Profile, for example, is brought to within 0.0001" of true involute. Surface of teeth is rendered bright and smooth . . . no squeal when such gears are run at high speed.

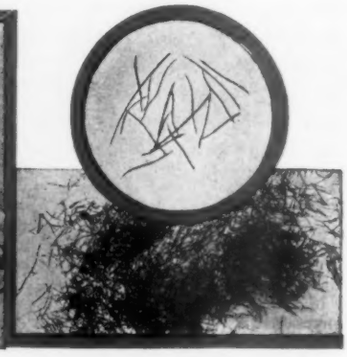
The machine employs limited crossed axis shaving at high speed. The cutter is a helical gear with gashed teeth. Fast cuts at slow feed . . . resembling fly cutter work . . . are taken as the cutter runs in mesh with the work gear. Action is *cutting* . . . not burnishing. No metal is compressed to rebound in heat treatment.

Write for complete data on the Red Ring Shaver. It produces better gears at considerably lower cost.



Enlarged view of gashed cutter. Cutter life of 35,000 to 75,000 work units is normal expectancy.

Close-up of cutter in operation.



Chips full size and magnified four times to show clean cutting action.

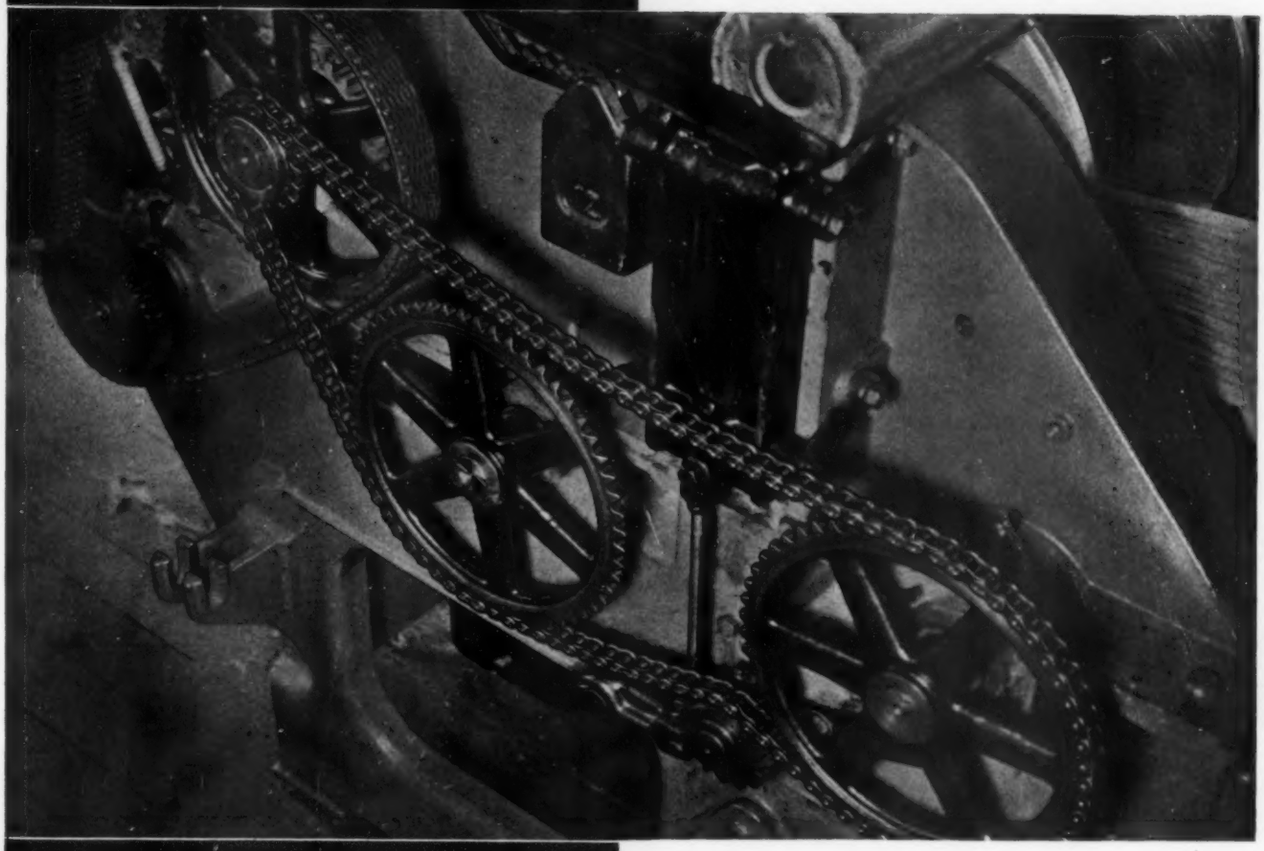
PATENTS APPLIED FOR AND ISSUED— 1989650; 1989651; 1989652.

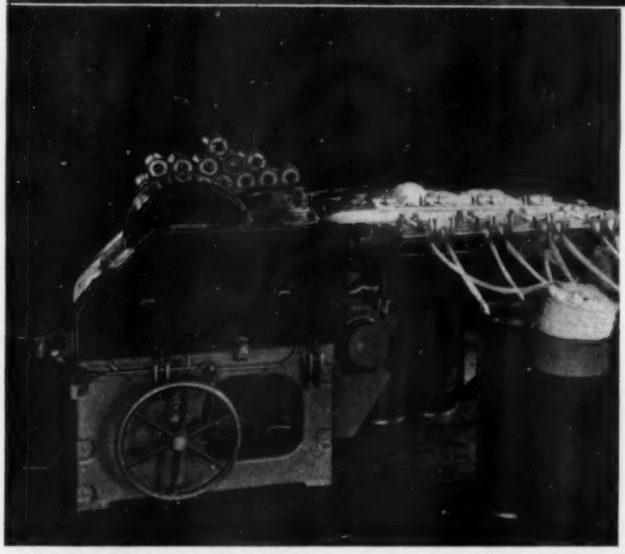
NATIONAL BROACH & MACHINE COMPANY

SHOEMAKER & ST. JEAN DETROIT, MICHIGAN

Saco Lowell's new Sliver Lap Winder is designed for improved production speed and quality of product. Whitney Chains play an important part in maintaining this high performance.

Design Again we say for Performance

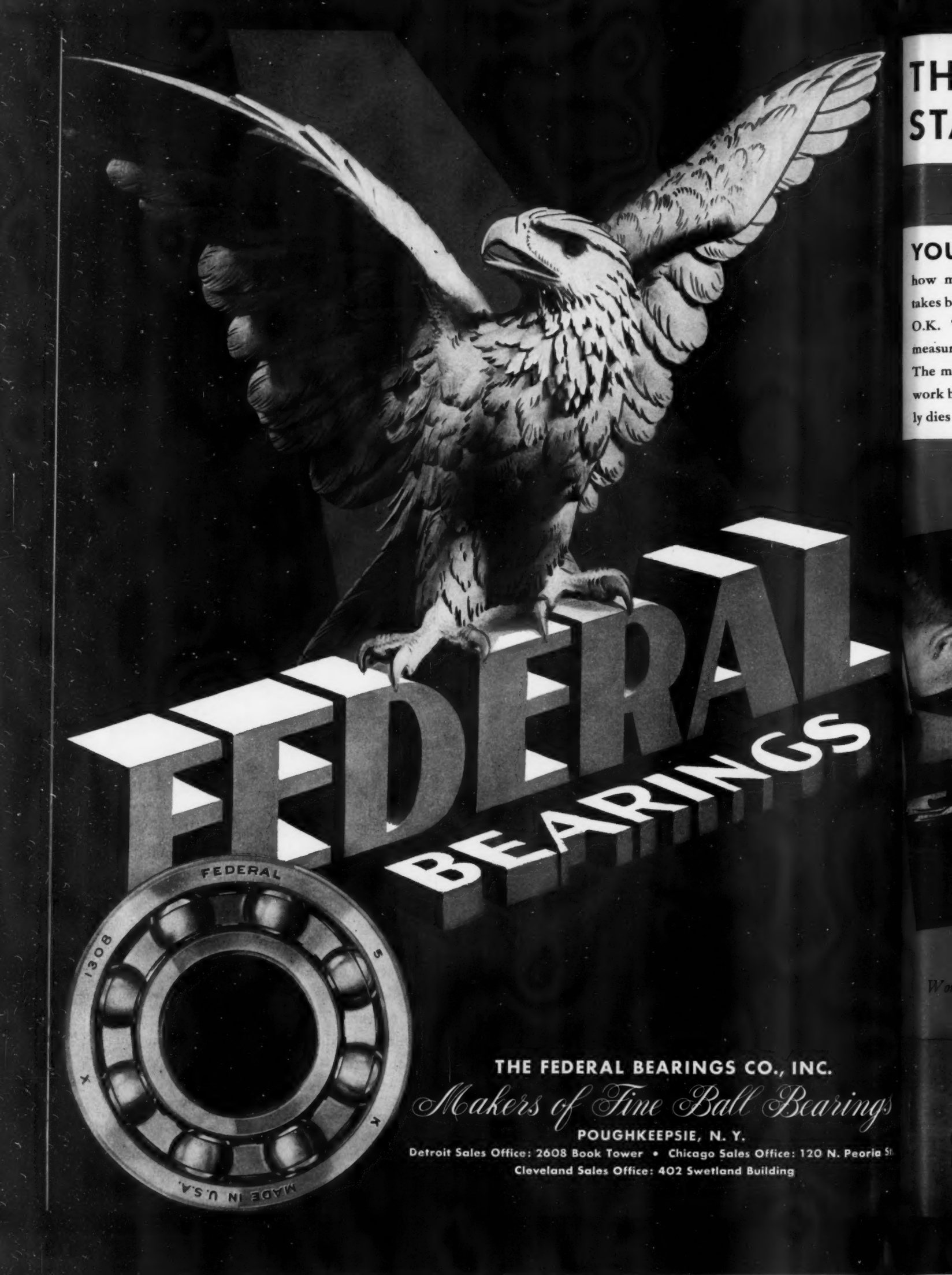




Performance does not just happen, it must be designed into a machine, using the combined experience of the engineer, manufacturer, and supplier of component machine units.

Whitney Chains were specified for the new Saco Lowell Sliver Lap Winder because they give smooth dependable power transmission with design advantages offered by no other one type of transmission medium. It will pay you to try Whitney Chain Drive performance on your own equipment. The Whitney Chain & Mfg. Co., Hartford, Connecticut.

WHITNEY CHAIN DRIVES



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Makers of Fine Ball Bearings

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THIS JOB IS *A NATURAL* FOR STARRETT SHOP EQUIPMENT TOOLS

YOU CAN GUESS

how much inspection work it takes before this baby gets a final O.K. This shop makes every measurement with Starrett Tools. The men have confidence. They work better and *faster*. And costly dies are rarely spoiled.

A PERFECT FIT!

Layed out, produced and inspected with the aid of Starrett Tools, dies like this come through well within close limits. Shops that do this kind of work almost invariably specify Starrett when they buy Precision Shop Equipment Tools.

WRITE for Revised Starrett Catalog No. 25C. It describes the complete line of Starrett Precision Tools.

THE L. S. STARRETT CO., ATHOL, MASS., U. S. A.

World's Greatest Toolmakers—Manufacturers of Hacksaws Unexcelled—Steel Tapes, Standard for Accuracy
Dial Indicators for Every Requirement

Standardize on

STARRETT TOOLS

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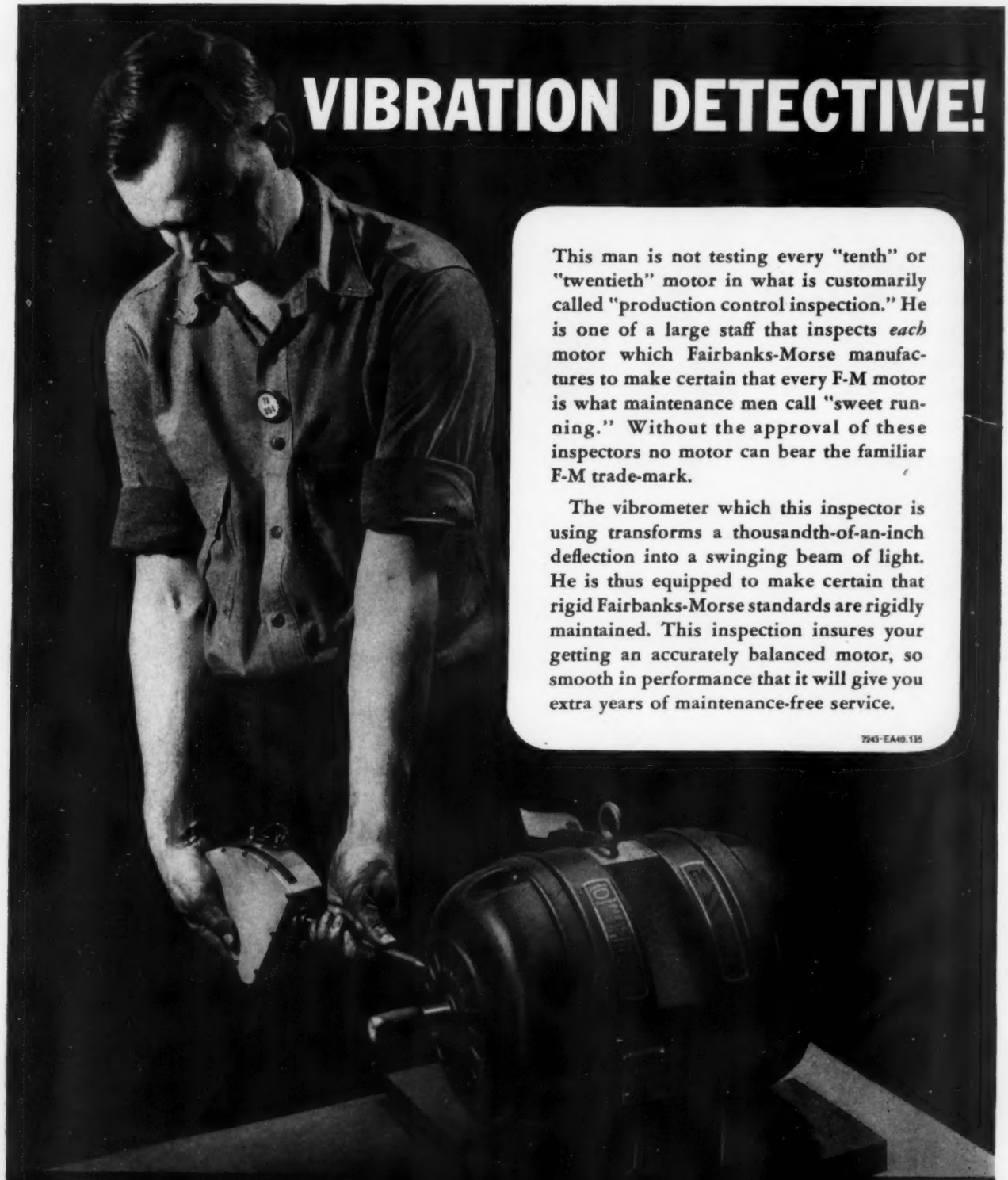

This man is not testing every "tenth" or "twentieth" motor in what is customarily called "production control inspection." He is one of a large staff that inspects *each* motor which Fairbanks-Morse manufactures to make certain that every F-M motor is what maintenance men call "sweet running." Without the approval of these inspectors no motor can bear the familiar F-M trade-mark.

The vibrometer which this inspector is using transforms a thousandth-of-an-inch deflection into a swinging beam of light. He is thus equipped to make certain that rigid Fairbanks-Morse standards are rigidly maintained. This inspection insures your getting an accurately balanced motor, so smooth in performance that it will give you extra years of maintenance-free service.

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F M

Motors

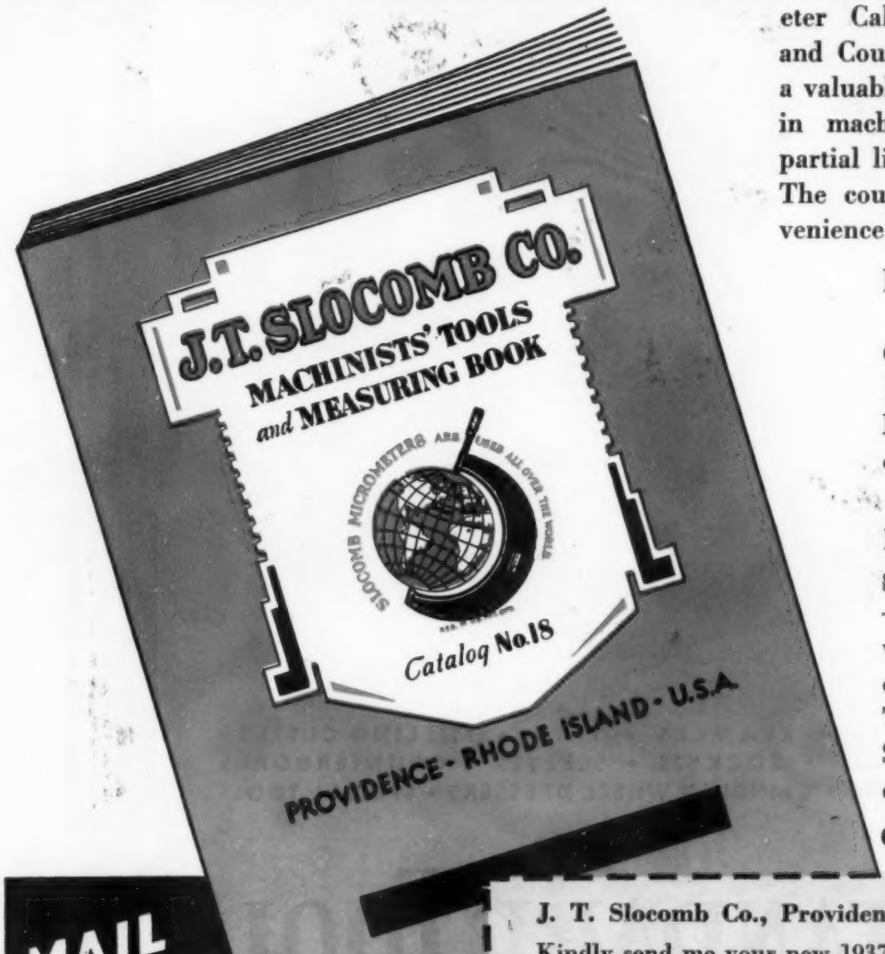
112 pages of useful information — Yours for the asking

The 1937 Slocomb Catalog of Fine Machinist Tools is just off the press — *Write for a copy*

The tools described in this new Catalog represent the work of nearly half a century's specialization in the manufacture of fine mechanics' tools—tools that are accurate and long-lived and which have won universal recognition in the tool rooms and on the production lines of the nation's leading metal working shops.

In addition to full details on Slocomb Micrometer Calipers and Combined Drills and Countersinks, this new catalog is a valuable textbook on tool measuring in machine construction. Note the partial list of contents.

The coupon below is for your convenience in sending you a copy.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SLOCOMB MICROMETERS ARE USED ALL OVER THE WORLD
Catalog No.18
PROVIDENCE - RHODE ISLAND - U.S.A.

Partial List of Contents

CATALOG

Center Drills — Combination Micrometer gauges — End Measures — Micrometers — etc., etc.

MEASURING BOOK

How to Read Micrometers graduated to ten thousandths — Table of allowances for various classes of fits — Table of Decimal Equivalents — Tables of Tap Drill Sizes — Screw Thread Tables — Table of Twist Drill Speeds, etc. etc.

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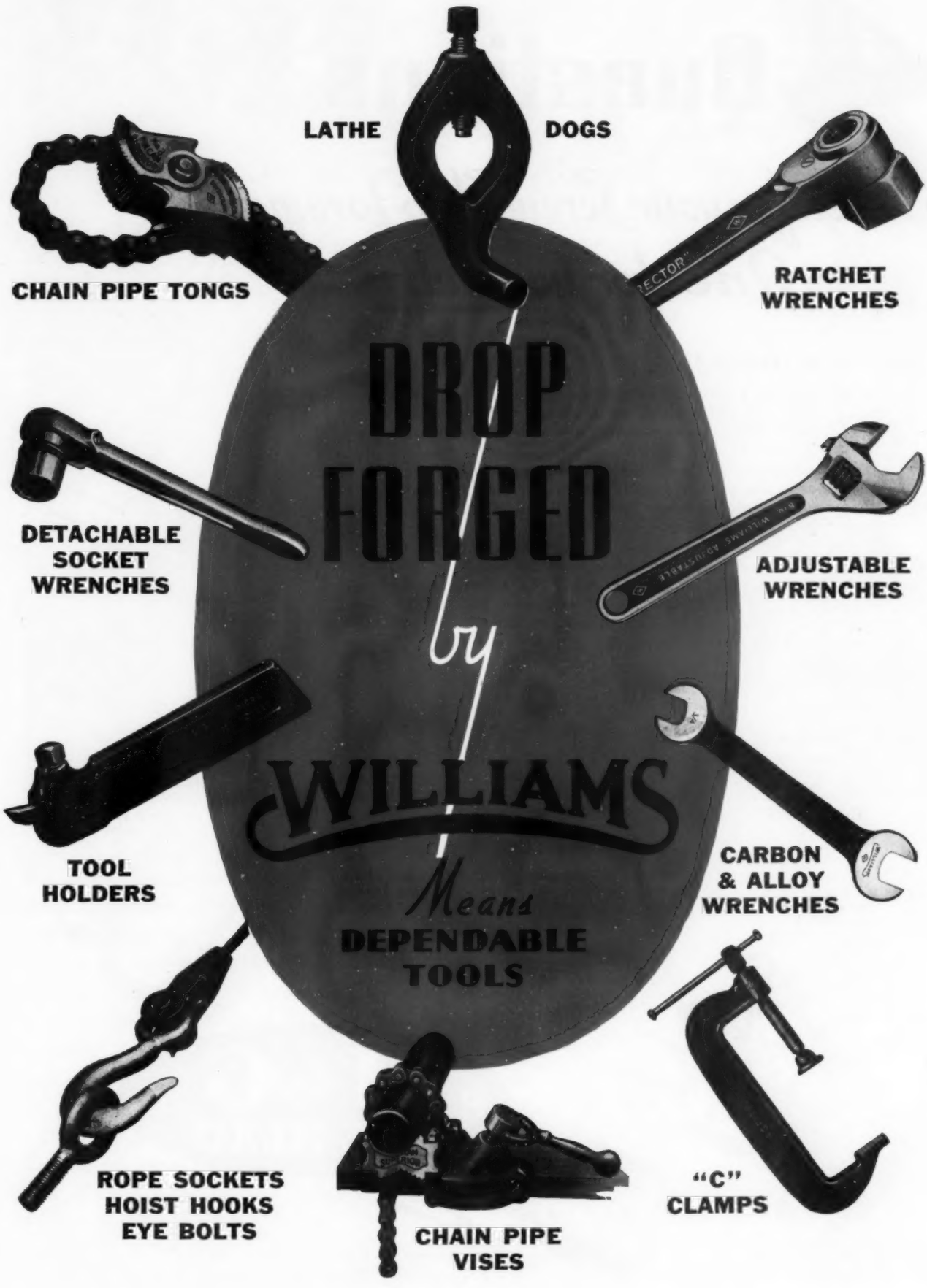
LATHE DOGS
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WILLIAMS
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DEPENDABLE
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"C" CLAMPS

4 Questions

•Three for your Screw Shop Foreman;
• One for yourself

ASK YOUR FOREMAN:

Would you like a die head so efficient that it always permits using new chasers—one where a dull set of chasers could be replaced by a new set with almost no adjustments and only a few minutes down time?

Would you like to use chasers that cost only a fraction of the price of other chasers and yet will usually run two or three times as long as the conventional chaser before getting dull and which can be inexpensively reground many times if desirable?

Would you like a die head that makes it possible to use the same chasers on many different sizes and types of machines?
Example: The same chasers on No 0 and No. 2 Brown & Sharpe★; Davenport; 9/16 in., ⅞ in., or 1¼ in. Gridley; ⅞ in. or 1¼ in. Cone; ⅞in., 1 in., 1¼ in. or 1⅜ in. New Britain, on different sizes of turret lathes, threading machines, etc., etc.

THEN ASK YOURSELF:

Would I like to reduce and simplify my chaser inventory, reduce my chaser cost per thousand pieces and reduce down time on threading jobs?

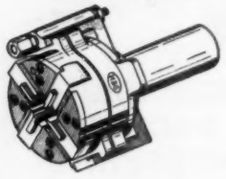
The H & G Insert Chaser Die Head provides all of these desirable features which may be summed up in the following five words—"SIMPLIFIED THREADING AT LOWER COSTS".

WRITE FOR LITERATURE.

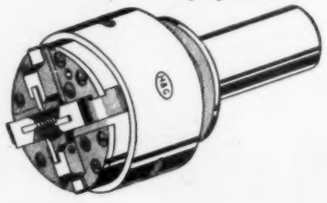
★ *There is a No. 00 size of Style DM head for the No. 00 Brown & Sharpe using smaller chasers but which easily threads up to ¼ in. diameter and which will show some astounding results as to quality of threads and economy of operation.*

THE EASTERN MACHINE SCREW CORP.
20-40 Barclay St., New Haven, Conn.

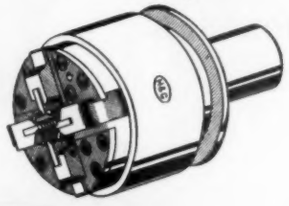
STYLE DM
for B&S Automatics and other small single spindles



STYLE MM
for rotary spindles

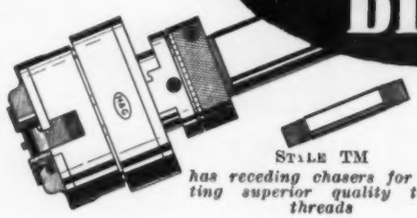


STYLE IMM
is equipped with improved internal trip for shoulder threading such as for spark plugs

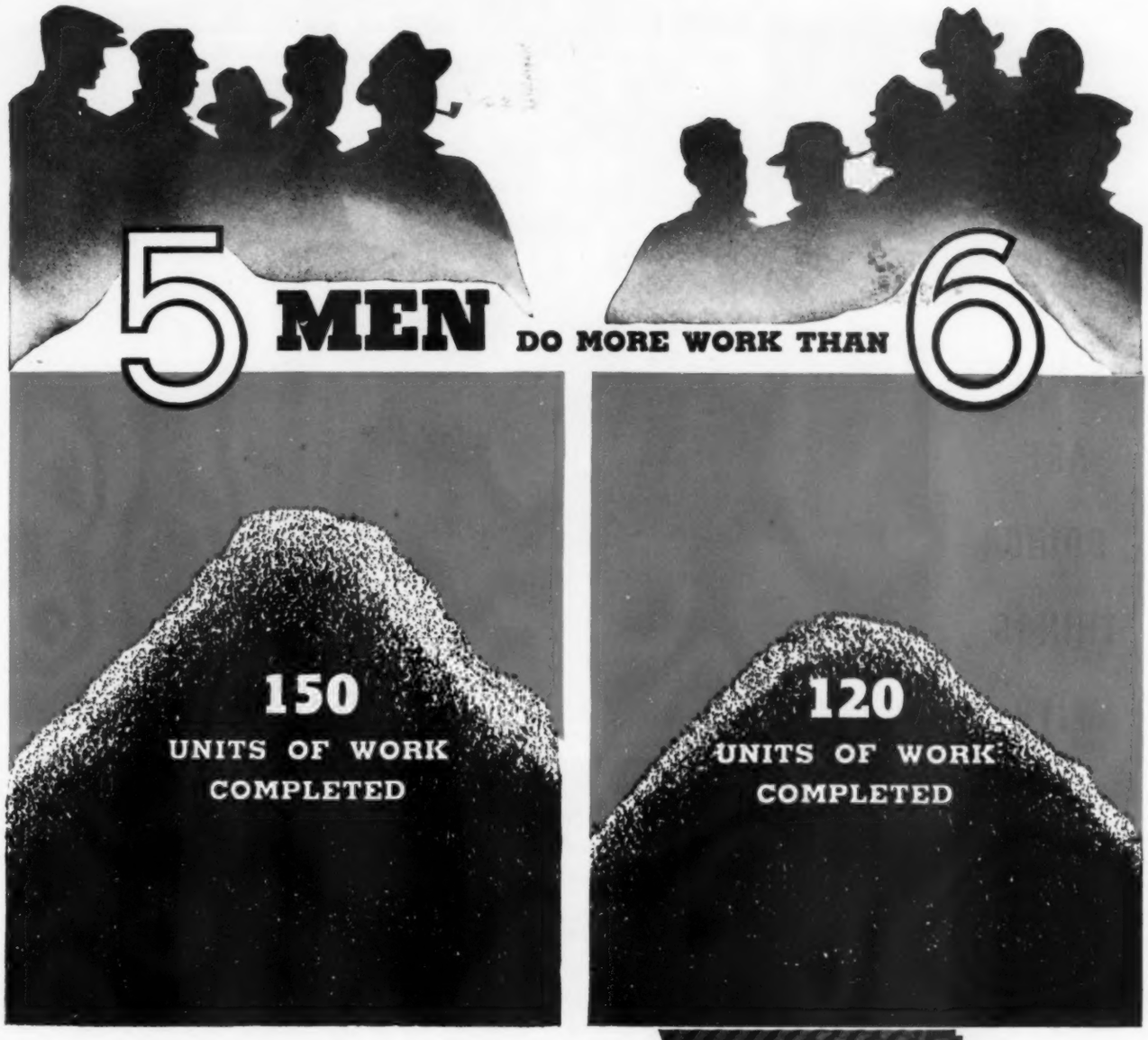


H & G DIE HEAD

STYLE MS
for hand turret machines



STYLE TM
has receding chasers for cutting superior quality taper threads



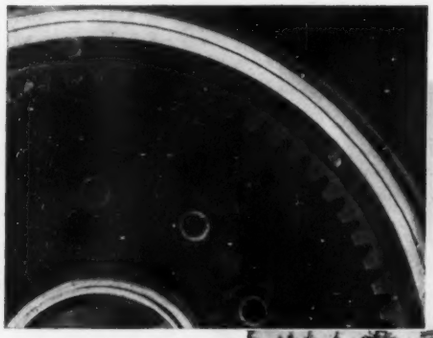
Five expert filers completing 150 units of work while six filers, just as expert, finish only 120!

Tests show that is exactly what would happen in your plant if you gave the five men Nicholson, Black Diamond or McCaffrey Files to work with . . . while the six men had to use a competing brand.

The demonstrated ability of Nicholson, Black Diamond and McCaffrey Files to remove more metal is an important reason for using them . . . *especially now when statistics indicate that for every six jobs requiring expert filers there are only five men to be found.*

These three leading brands not only cut faster. They are uniformly high in quality and cost less to use. Set them to work in your plant. Your mill supply dealer can meet your needs promptly. Nicholson File Company, Providence, R. I., U. S. A.

A FILE FOR EVERY PURPOSE



DuFELT between the wheel gear and the wheel hub is used as a seal for the gears in the high-powered Walter Four Point Positive Drive Tractor Trucks and Snow Fighters.

THE WALTER HAULING 40 TONS OF LOGS

ENGINEERS ARE DOING THINGS WITH

FELTERS DuFELT

NEOPRENE — LAMINATED

DuFELT is an industrial product that has earned high ranking in hard service — a material that has come into wide industrial use on its record of incomparable fitness for the job, its thoroughgoing performance on the job.

Felters DuFELT (Neoprene-laminated) asks no favors on the assembly line nor in the field. Because it is engineered by *Felters* to close tolerances, it needs no fitting, pushing or special handling in assembly. Because it is made of wear — and deterioration-resisting *Felters Felt* and oil-sealing, dirt-excluding Neoprene laminations in various combinations, it performs efficiently and enduringly under the most adverse conditions of service.

DuFELT is resistant to the action of all petroleum products — resists oxidation (does not become hard and brittle with age) — does not vary in size with temperature changes — retains its bonding properties and elasticity consistently in the presence of oil — stands heat over long periods without softening or breaking up.

Engineers are doing things with DuFELT — and DuFELT is doing things for their products. If the product you manufacture calls for efficient, long-lasting washers, gaskets or other oil sealing, dirt, — moisture — or fume-resisting forms, try DuFELT. It will stand up and do its duty where other products fail. Your inquiry will bring full engineering cooperation.

THE FELTERS COMPANY, INC.

Manufacturers of Felt and Felt Products

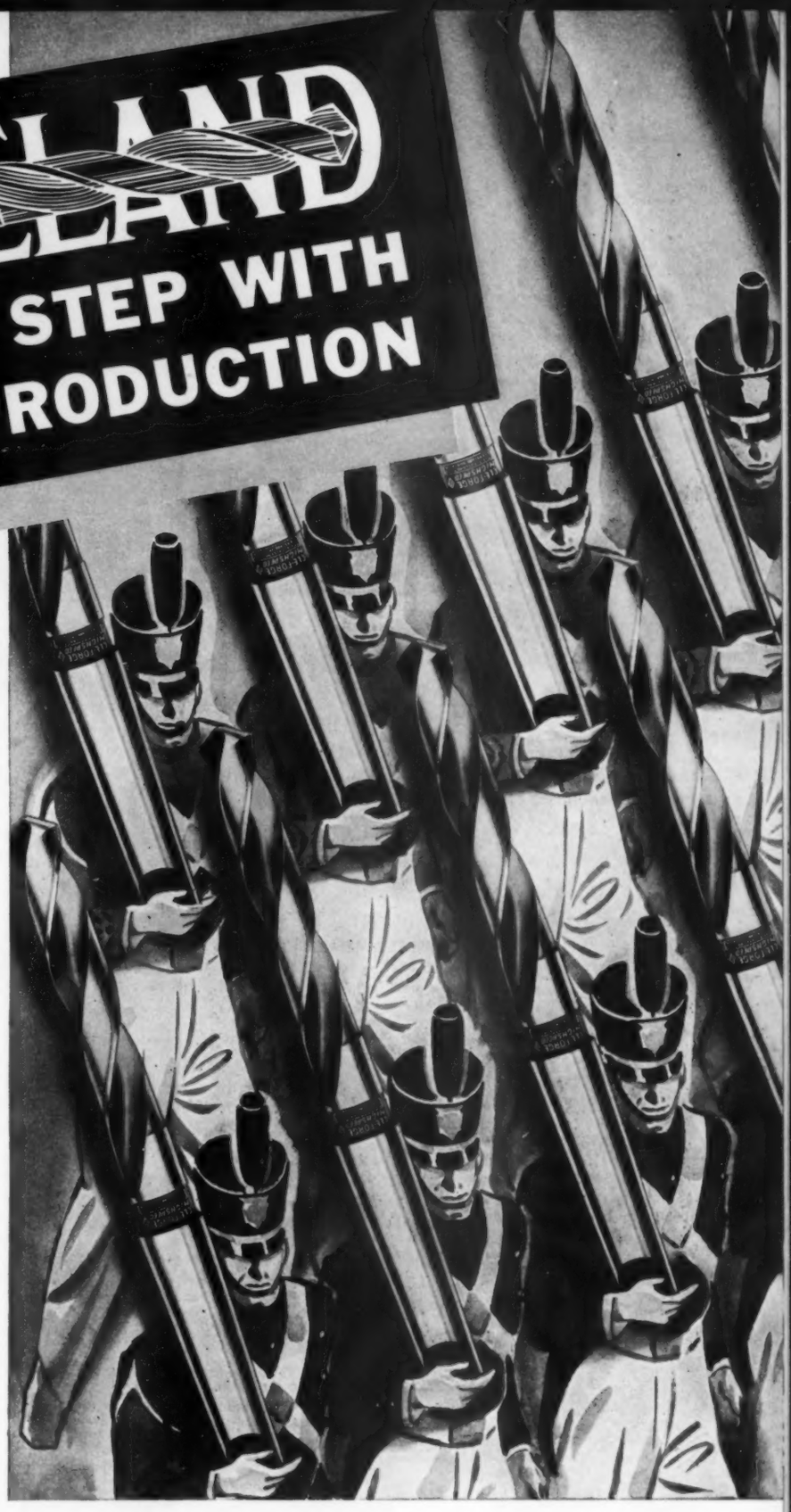
210 SOUTH STREET, DEPT.-AM, BOSTON, MASS.

Mills: Millbury, Mass., Johnson City, N. Y., Jackson, Mich.

Offices: New York, Chicago, Philadelphia, St. Louis, Dallas, Detroit, San Francisco, Mexico City

BROWN INSTRUMENT COMPANY

CLEVELAND HAS KEPT STEP WITH MODERN PRODUCTION



As a perfectly trained army unit swings past, the first thing on notice is its precision of motion—men, arms, legs, guns. Keeping step and keeping up to the minute in technique is the secret.

So, too, with the rapid progress that has been made during the past few years in the mass production of parts, "Cleveland" Twist Drills and Reamers not only have "kept step" but have necessarily been several steps in advance of industry. What with new metals and new production methods, it *has been necessary* for us not merely to meet your requirements, but to *anticipate* them.

As it is, we do not hesitate to ask you to put your most difficult drilling and reaming problems up to us. Probably we already have solved them. If we have not, we have a Staff that is well qualified to tackle them.

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
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reaches its major markets through consistent advertising in these McGraw-Hill Publications—

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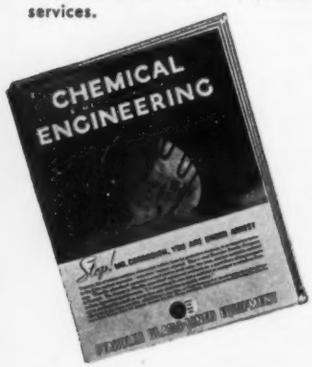
FACTORY MANAGEMENT and MAINTENANCE—to reach production and maintenance executives in the manufacturing industries.

POWER—to reach the men responsible for the efficient operation and maintenance of industry's power plants and auxiliary power services.



CHEMICAL & METALLURGICAL ENGINEERING—to reach the responsible men in the "process industries" — chemicals, cement, lime, paint, glass, paper, oil, etc.

PRODUCT ENGINEERING — to reach those engineers and executives concerned with the design, development and improvement of machines and equipment.

FOOD INDUSTRIES — to reach the men concerned with the manufacturing processes involved in the production of food.

AMERICAN MACHINIST—to reach those who are concerned with the special manufacturing and production problems of the metal-working industry.

TEXTILE WORLD—to reach the men who are most intimately concerned with the manufacturing and proc-

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"TUNES IN" TO PROCESS CONTROL
As Easily as Dialing a Radio
A simple screw-driver adjustment of the graduated "Automatic Reset and Throttling Range Dials" gives you exact control of temperatures, pressures, flows and liquid levels.
There is no guesswork or dismantling of the instrument to obtain the desired control results. You can see how adjustments for different operating conditions can be noted and duplicated at any time.
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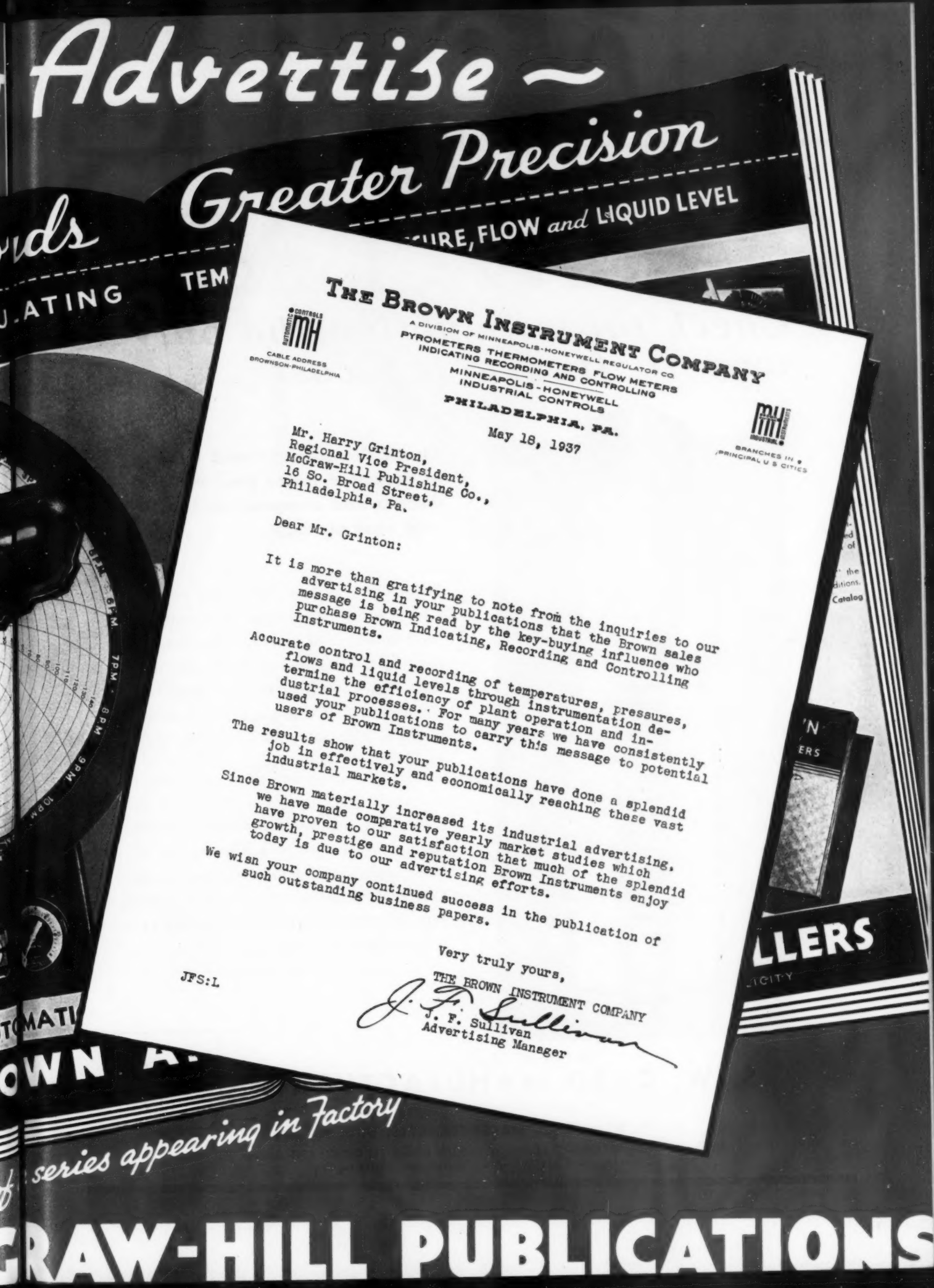

THE BROWN INSTRUMENT COMPANY

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BRANCHES IN 9 PRINCIPAL U.S. CITIES

May 18, 1937

Mr. Harry Grinton,
Regional Vice President,
McGraw-Hill Publishing Co.,
16 So. Broad Street,
Philadelphia, Pa.

Dear Mr. Grinton:

It is more than gratifying to note from the inquiries to our advertising in your publications that the Brown sales message is being read by the key-buying influence who purchase Brown Indicating, Recording and Controlling Instruments.

Accurate control and recording of temperatures, pressures, flows and liquid levels through instrumentation determine the efficiency of plant operation and industrial processes. For many years we have consistently used your publications to carry this message to potential users of Brown Instruments.

The results show that your publications have done a splendid job in effectively and economically reaching these vast industrial markets.

Since Brown materially increased its industrial advertising, we have made comparative yearly market studies which have proven to our satisfaction that much of the splendid growth, prestige and reputation Brown Instruments enjoy today is due to our advertising efforts.

We wish your company continued success in the publication of such outstanding business papers.

Very truly yours,

THE BROWN INSTRUMENT COMPANY

J. F. Sullivan

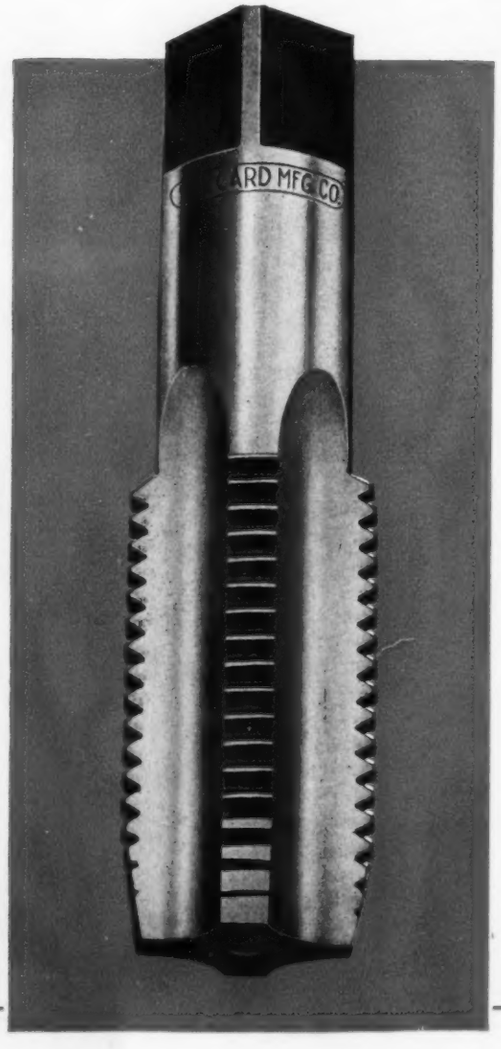
J. F. Sullivan
Advertising Manager

JFS:L

1874 The CARD Quality 1936

CARD TAPS

Check tap production the only way to figure tap cost . . .



Check the number and quality of threaded holes you are producing and compare with original cost per tap.

When users of taps follow this practice Card Quality is immediately recognized. Card Quality is 62 years old. Valuable experience has been gained in the manufacture and uses of taps. Card engineers are qualified to work with you to obtain the results you are looking for to help you get a lower cost on quality tapping.

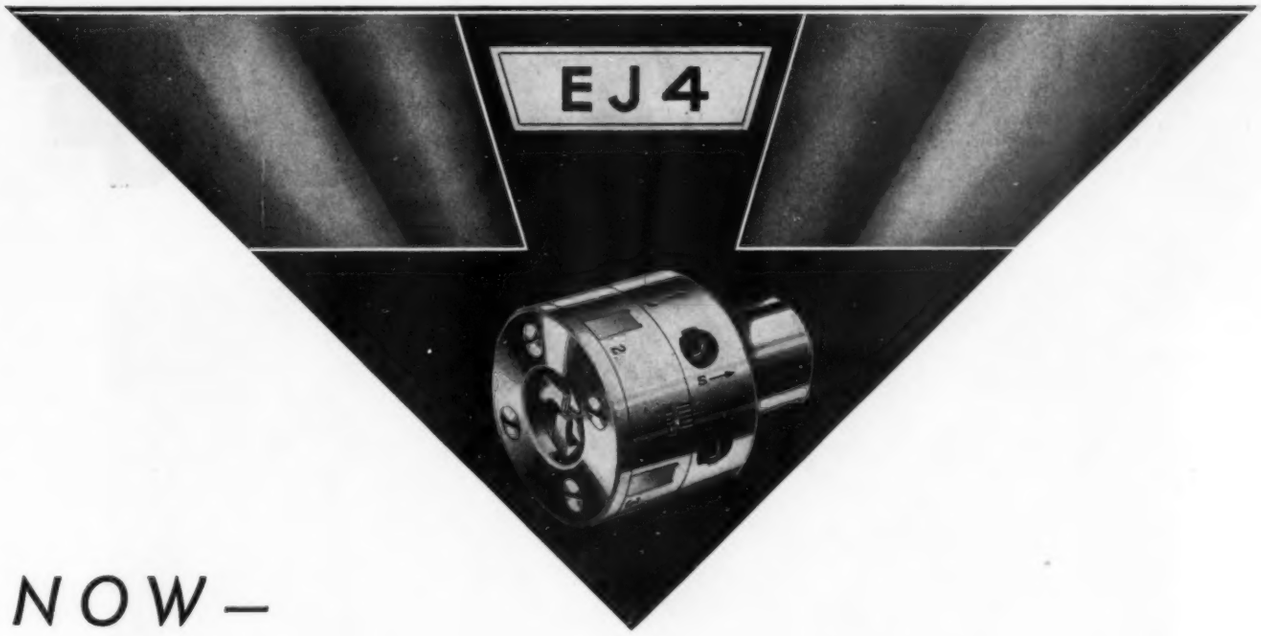
Card Taps command the market price for quality tools and no more. Catalog No. 33, latest issue, showing the complete line in CARBON, HIGH SPEED CUT AND HIGH SPEED GROUND THREAD TAPS. Send for your copy.

S. W. CARD MANUFACTURING CO.

DIVISION OF UNION TWIST DRILL CO.

MANSFIELD, MASSACHUSETTS, U. S. A.

Stores: New York: 61 Reade St., Chicago: 11 South Clinton St., Detroit: 6540 Antoine St., San Francisco: 121 Second St., Seattle: 568 First Ave. South



NOW— you can thread them with a GEOMETRIC—

Invading a new field of small diameter threading, Geometric presents the Style EJ4 Solid Adjustable Die Head. This new tool brings to the present users of solid dies all the advantages of adjustable, removable-chaser die heads, and the assurance of the Geometric trade mark.

The cost of the EJ4 is small, and the cost of chasers is less than most solid dies. The chasers can be resharpened often, giving longer life. And adjustment within the head makes the last thread as accurate as the first.

Four rigidly-supported, Milled type chasers are used. The tool is light and compact—small enough to swing in the No. 00 Brown & Sharpe Automatic Screw Machine. Diameter of head—1", length without shank—¾". Built with plain shank, or with threaded backpart for the Brown & Sharpe Threader.

Send for your copy of the catalog folder describing the Style EJ4. Those small diameter threads need no longer tie up your production—now you can thread them with a Geometric!

Specialists in screw-threading tools and equipment since 1895.

THE GEOMETRIC TOOL COMPANY

NEW HAVEN, CONNECTICUT

A SIGNIF

"Maxi" taps and other "Maxi" tools receive a special surface treatment which makes them extra tough and long lived. They stay sharp longer, do not wear as rapidly and give materially increased production.

Maxi they're Black *Tools*

GREEN

ICANT FACT

The average 1937 tap produces many times the number of tapped holes which a "war" tap or a 1929 boom tap could turn out. Yet today Greenfield Tap & Die Corporation is manufacturing and delivering taps in greater quantities than at any time in its 62 year history *including 1917-18 and 1929.*

The explanation is quite simple. The amazing performance of "Maxi" taps—due to their special surface treatment developed by *"Greenfield"*—has resulted in their almost universal adoption wherever they have been tried.

Tests will be gladly arranged for manufacturers who are not yet "Maxi-conscious."

GREENFIELD TAP & DIE CORPORATION
Greenfield, Massachusetts
Detroit Plant: 2102 West Fort Street
Warehouses in New York and Chicago
In Canada: Greenfield Tap & Die Corporation of Canada, Ltd., Galt, Ontario

FIELD

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expanding KNOCK-OUT mandrels

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They will pay you dividends, too

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K. O. LEE & SON CO. ABERDEEN, S. D.

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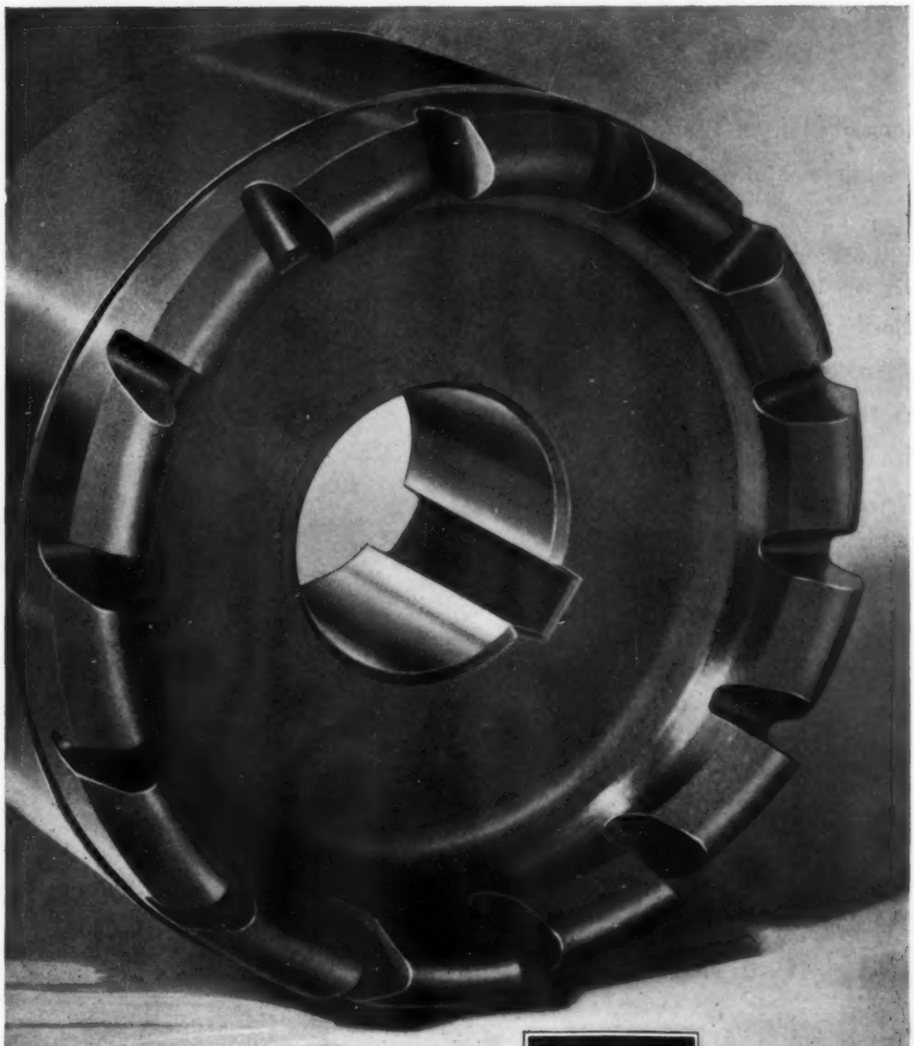
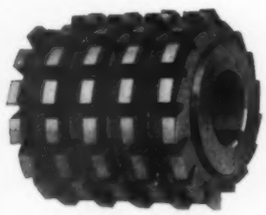
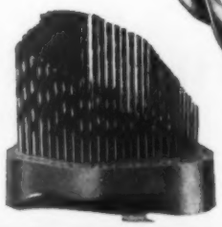
by
NATIONAL

Special Tools, as well as Tools of Standard Types and Sizes, bearing the NATIONAL name, will serve you longer and better.







TWIST DRILLS • REAMERS • HOBS MILLING CUTTERS • SPECIAL TOOLS

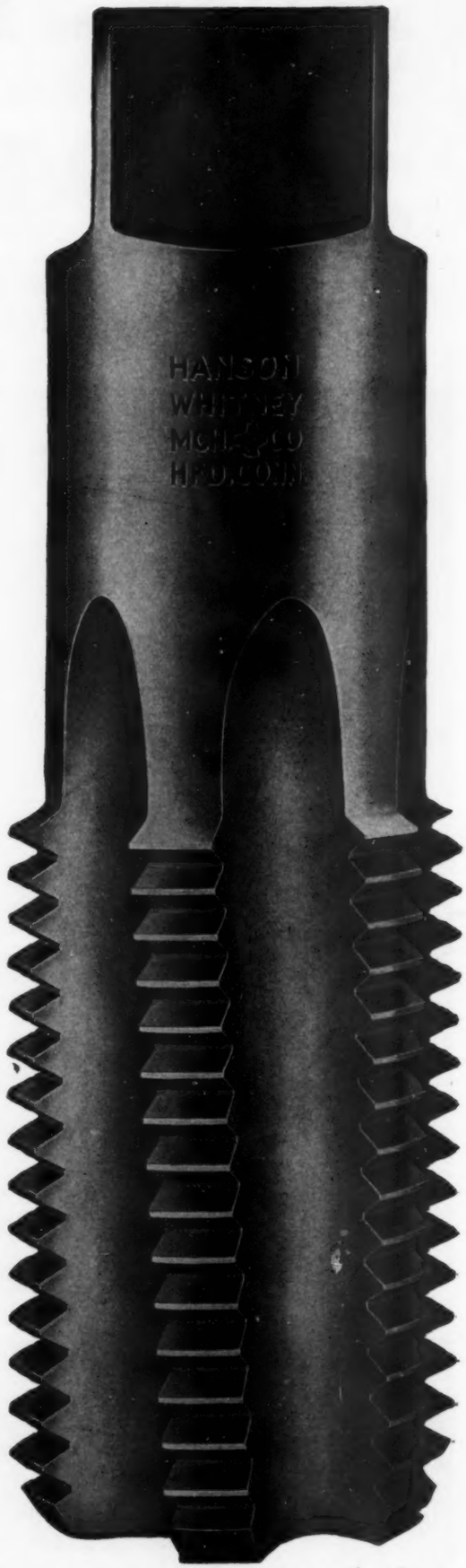
NATIONAL TWIST DRILL AND TOOL CO.

DETROIT U. S. A.

Tap and Die Division, WINTER BROS. CO., Wrentham, Mass.

Factory Branches: • New York • Chicago • Philadelphia • Cleveland • Distributors in Principal Cities

Finished After Hardening Is the Answer



The quality and economy of Hanson-Whitney Precision Taps are the simple results of H-W production methods.

Correctly hardened by modern scientifically controlled methods, finished after hardening by H-W precision processes, these taps are quality tools. Watch them perform. They cut clean accurate threads fast; they deliver an unusual amount of work between grinds; they stand up to the limit on tough jobs—in short, Hanson-Whitney Precision Taps are real economy tools.

Let us send Catalog with Sizes and Prices.

TRY H-W TAPS

THE HANSON-WHITNEY MACHINE CO.

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MACHINERY and SMALL TOOLS—Cincinnati, Ohio, Seifreat-Elstad Mchy. Co.; Dayton, Ohio, Seifreat-Elstad Mchy. Co.; Detroit, Mich., Berry Thomas; New York, N. Y., L. C. Biglow & Company, Inc.; Pittsburgh, Pa., William K. Stamets; Rochester, N. Y., A. G. Brice; Houston, Texas, Wessendorf, Nelms & Co.; Toronto and Montreal, Canada, Arthur Jackson Mche. Tool Co.

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LOWER MAINTENANCE

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Send for 16-page illustrated Booklet S.P. 1876 showing construction and giving detailed specifications of all types and sizes of "POWER VANE" TOOLS

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CHICAGO PNEUMATIC

CRAFTSMANSHIP

Augmented by years of tool-making experience, Morse craftsmanship sets standards of inspection, of grinding and heat-treating that puts "extra values" into Morse Tools. So that, in shops throughout America and the world, men point to Morse efficiency, clean work, long tool life and say, "There Is A Difference."

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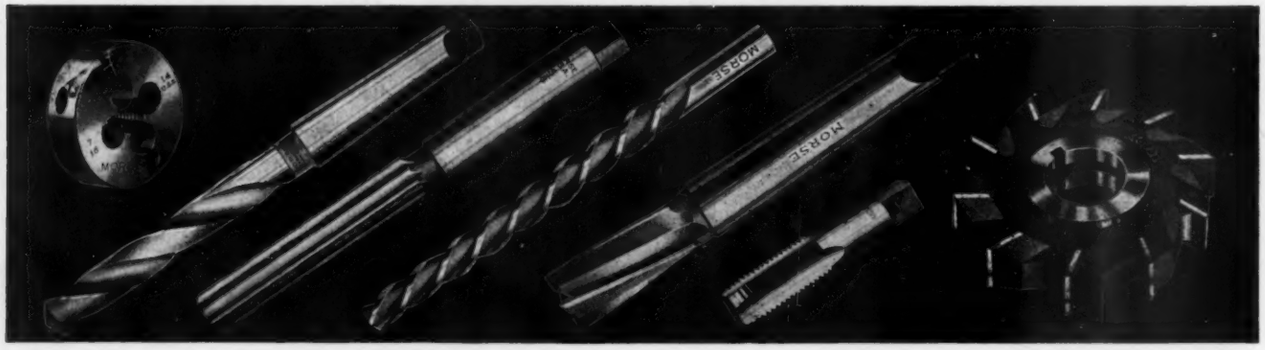

BECAUSE NEW MACHINES ARE MUCH IMPROVED

Your Junk Pile May Be a Measure of YOUR PROFITS

Replacing old machine tools with modern ones often results in such large savings in production costs that the size of your junk pile of obsolete machine tools may literally be a measure of your profits. The more extensive your replacement program, the greater your savings.

Modern machine tools, like the 3-way hydraulic driller shown below, give shorter floor-to-floor time, less scrap loss, and closer tolerances, than the machines of only ten years ago.

When you purchase new machine tools, specify G-E for all the electric equipment. You can be sure then that it is completely co-ordinated. And wherever you are located, you'll find a G-E service shop close at hand, equipped for quick service on every type of electric apparatus. General Electric, Schenectady, N. Y.

Make Three Inventories THIS YEAR!

1. Inventory the machine tools you are now using.
2. Inventory the progress made by machine-tool builders since your machines were purchased.
3. Inventory the progress made by General Electric in improving electric equipment to meet present-day demands.

NATCO 52-spindle hydraulic driller, equipped with G-E totally enclosed, fan-cooled motors, and with G-E control

GENERAL ELECTRIC

Filing No. 8579

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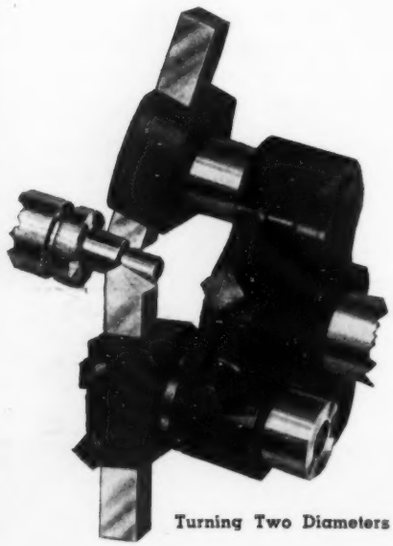
ALL THESE WITH *ONE*

How many tools do

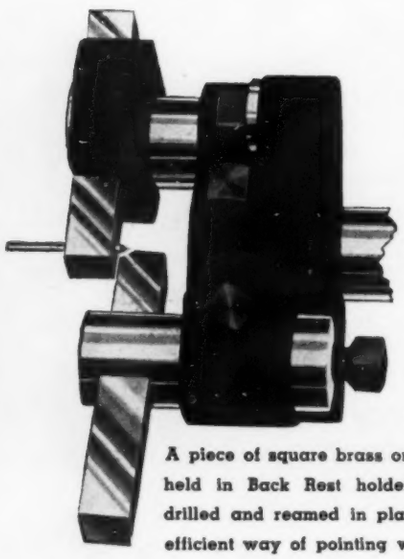
Drilling and Chamfering

HAVE YOU ANY TOOLS WHICH WILL DO THE OPERATIONS ON THIS PAGE? IF NOT— TRY R AND L



Turning Two Diameters

Turning and forming special shape on end of part while drilling or reaming



A piece of square brass or phosphor bronze held in Back Rest holder and with hole drilled and reamed in place makes a very efficient way of pointing very slender work

R & L COMBINATION

It Turns — Drills — Burnishes — Centers

In addition to replacing an assortment of fourteen tools, this New Combination Tool is the only Right and Left Hand Tool on the market. It can be changed from Right to Left in ten seconds, and vice versa.

May be used for roughing and finishing cuts. Heavy cuts are possible with this tool because thrust is in direct line with the backrest at all times. Finish is excellent, free from chatter marks.

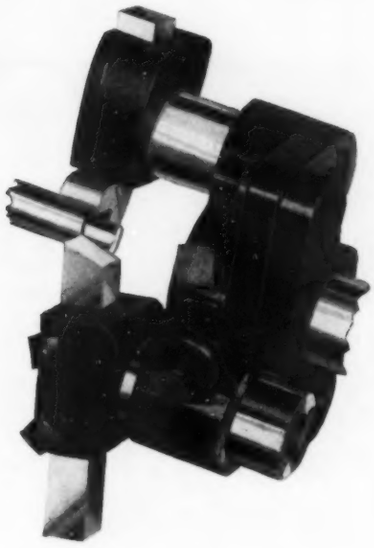
The extremely hard surface of the Tantalum

R and L

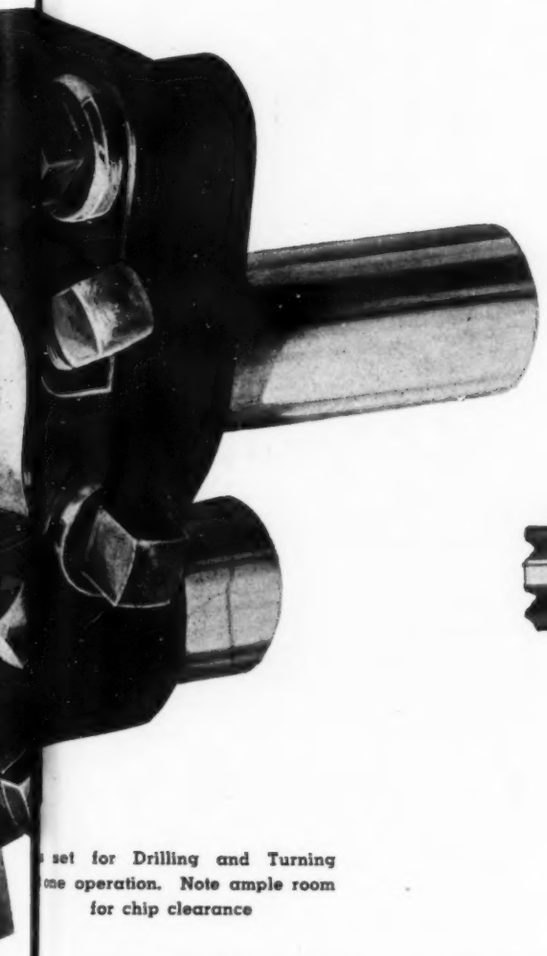
NICETOWN

OPERATIONS TOOL!

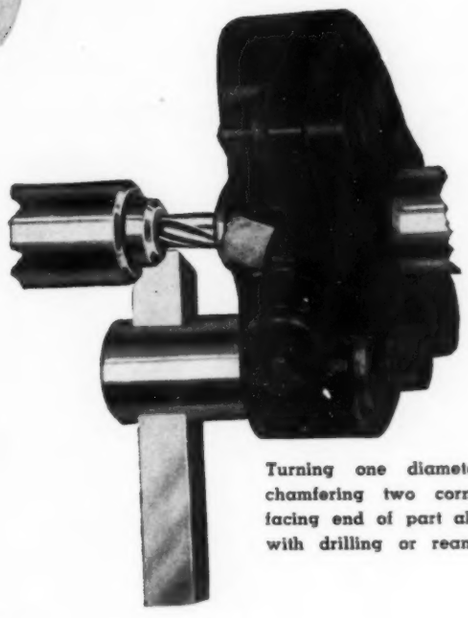
you have to have?



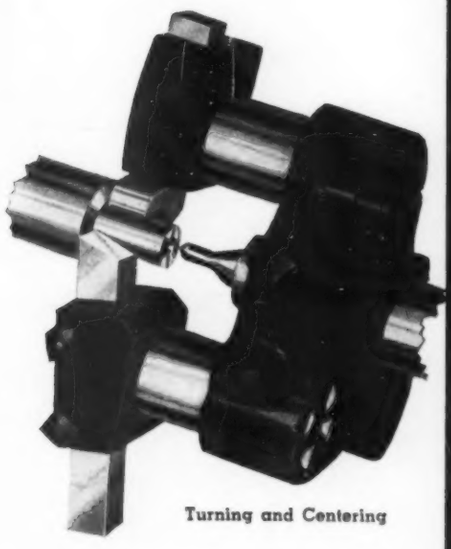
Turning shoulder concentric with stock diameter



set for Drilling and Turning
one operation. Note ample room
for chip clearance



Turning one diameter—
chamfering two corners,
facing end of part along
with drilling or reaming



Turning and Centering

TURNING TOOL

Carbide backrests, or burnishers, make it impossible to pick up the metal and mar the surface of the work with scratches or blisters.

The cutting tool can also be furnished with a Carboloy Tip to take care of difficult metals such as Nickel Alloys, Bronze, Nitralloy and Stainless Steel.

The R & L is a real money-making production tool with hundreds in daily service in leading screw-machine shops.

Write today for full particulars and prices.

TOOLS

PHILADELPHIA, PA.

Turned part with large
radius and drilling. Back
Rest set to support work
over straight turned
diameter

CUTS OFF Practically WITHOUT BURR

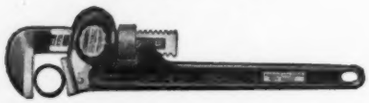
And This RIGID Thin Tool Steel Blade Wheel Is The Reason

If you want a new experience that will show you how quickly, easily and cleanly pipe can be cut, try a RIGID Cutter.

You'll find the patented RIGID Cutter wheel a real improvement. Coined out of tool steel sheet, hammered, heat-treated and cast into a steel-bearing hub, it rolls smartly through any pipe, practically without burr—many more cuts per wheel.

Try one at your Jobber's

Save 75% of Your Pipe Wrench Repairs



The RIGID Wrench housing is unconditionally guaranteed not to break or warp—so goodbye to 75% of your wrench repairs.

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RIGID PIPE TOOLS

PIPE WRENCHES, CUTTERS, THREADERS, VISES, EXTRACTORS

Columbia TOOL STEEL

The compositions and characteristics are clearly shown in all Columbia literature.

There are no unpleasant surprises when you buy this tool steel.

It pays to use Good Tool Steel.

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● Thousands of toolmakers would say the same. For precision, they depend exclusively on

JOHANSSON

GAGE BLOCKS AND ACCESSORIES

Manufactured and serviced in the United States by

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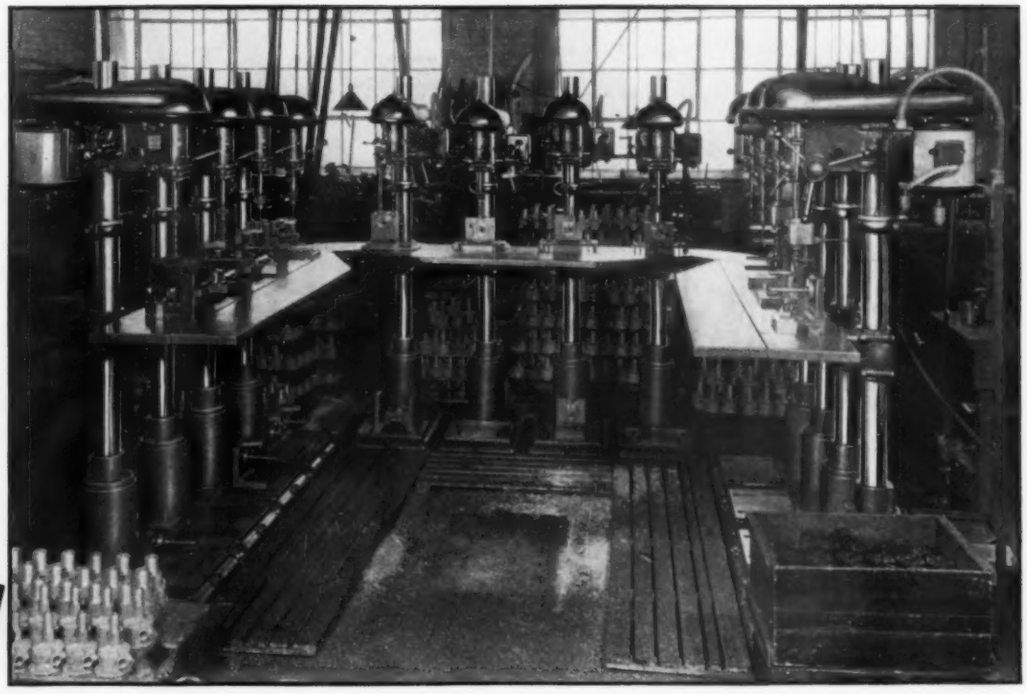

A battery of twelve 17" Delta drills saving money for a Detroit auto accessory manufacturer.

4 Big Reasons For Your Using "Delta" Drill Presses

●

1

They are low in first cost.

2

They are extremely economical to maintain and operate.

3

They are highly adaptable, and engineered for long life.

4

They will continue to save you money throughout their entire life.

Because Delta drills are built to precision standards in a modern production plant, they cost you less than any comparable drills you can buy.

Because they are equipped with self-sealed ball bearings throughout, they require no lubrication at any time—and practically no other maintenance.

Because they are thoroughly engineered and tested under production, they will "stand up and take it" alongside drills costing several times more.

Because of their low cost, low maintenance and low power consumption, they can be used in dozens of places in your plant where heavy, expensive machines would be out of the question.

Let us tell you the complete story of Delta Drill Presses, 11″, 14″ and 17″ models. Write — Now — for complete information and name of nearest dealer. It will pay you dividends.

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FILES TRADE · ONLY THE BEST ARE GOOD ENOUGH · TOOLS MARK

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BUT Files for Low Cost Production

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Cuts Nos. 00, 0, 1, 2, 3, 4 and 6

Buy from nearest distributor

AMERICAN SWISS FILE & TOOL CO., Elizabeth, New Jersey

Buy from the Distributor

Also Manufacturers of Mechanics Hand Tools and Knurls

L-W TOOLS *pay Big dividends*

• After all, the real reason for replacing obsolete tools with modern equipment is to save money—in time, labor or material. L-W Tools pay BIG DIVIDENDS on the investment because in one way or another they reduce production costs. A few items in the L-W line are briefly described here. Mail coupon below for complete information.

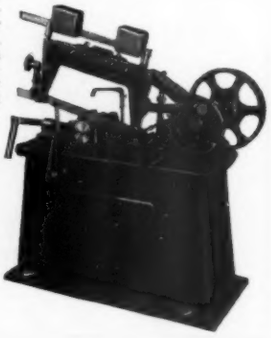
L-W MAGNETIC CHUCKS

Available in various sizes and types for all machining operations to which *where* magnetic chucks are adaptable. Powerful, dependable, efficient.

Size shown: Working Surface 5¾ in. wide, 13 in. long; Price: **$45.00.**

4-L-W INDEPENDENT LATHE CHUCKS

These chucks stand the gaff and pay for themselves in accuracy and long life. Semi-steel construction with heavily ribbed body insure positive operation under heaviest strains. Ground finish, each of the four independent jaws accurately ground and fitted hardened steel. Reversible.



L-W HIGH SPEED POWER SAW

A new tool and another big money-maker. Capacity 6x6 in. Uses 10- to 14-in. blades and provides automatic relief on the non-cutting stroke. An automatic trip stops machine at end of cut. Highly efficient and accurate.

Equipped with gravity feed, length gauge, expanding clutch and dovetail saw frame guide.

Shipping weight 460 lbs.

Price: **$160.00**

L-W CHUCK CO., Toledo, Ohio

Gentlemen: Kindly send me complete information on: ( ) **Lathe Chucks;** ( ) **Power Saws;** ( ) **Magnetic Chucks;** ( ) **Dividing Heads;** ( ) **Demagnetizers—Milling Machine Vises.**

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Position .....

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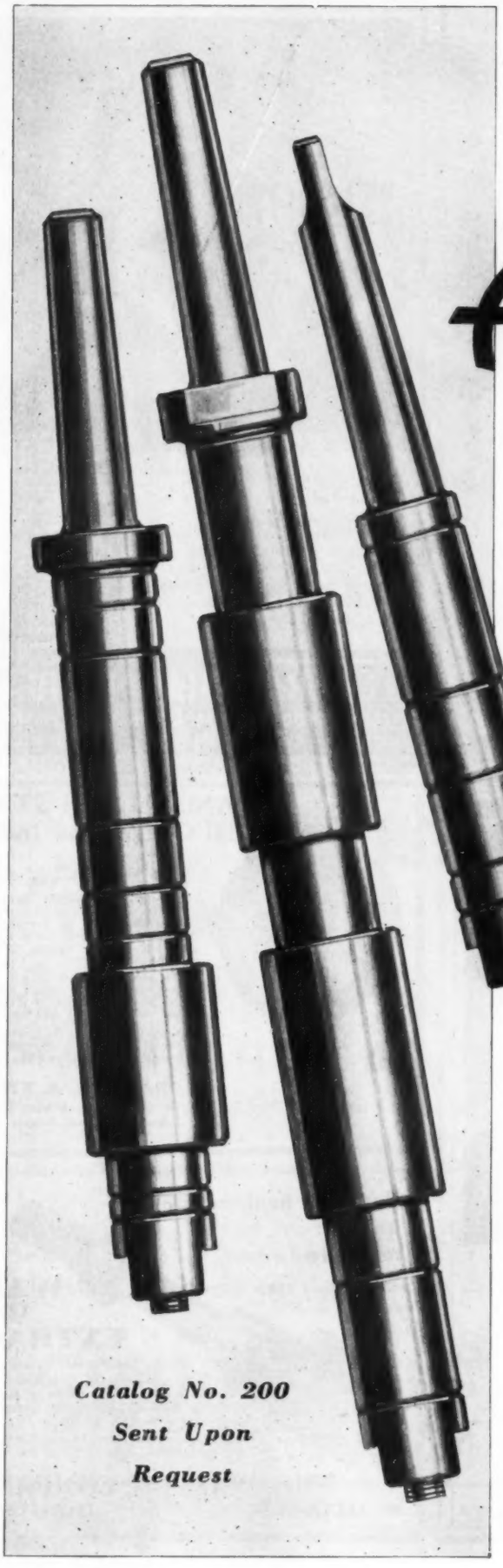
L-W CHUCK CO.
No. 5 North St. Clair Street
TOLEDO . . . . OHIO



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TO SURFACE STRUCK

USE THE
BASA
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ANY KIND OF BLOW CAN BE STRUCK

The clamping jaws can be set up to take care of shrinkage. Faces cannot fall out or rattle in head.

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Made in Five Sizes

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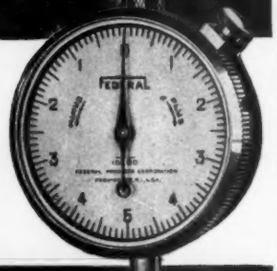

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Shockless The Ames Shockless Gauge will take more blows at the spindle end, withstand more general rough treatment and retain its original setting and smooth action longer than any other gauge made. For details, send for the Ames Gauge catalogue.

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Dial Gauges and Indicators

Model C

are accurate, reliable and built to stand the gaff of hard usage.

This Model C Dial Indicator has a 2½-in. diameter dial, with 50 or 100 divisions. Can be furnished in graduation of .001-in., .0005 in. or .01 mm. Has a ½-in. range, movable dial easily set at zero.

The cases on all R.&S. Gauges are made from sturdy castings. The case and plate are two separate units, so that repairs can be made easily.

There is a R.&S. Gauge for practically every purpose. Write for catalog describing our complete line.

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Waltham, Mass., U. S. A.
Makers of Dial Gauges Since 1858

Remove broken taps quickly . . . *with the*

WALTON TAP EXTRACTOR

Save time, effort and expense.

Taps broken at or below the surface of the work can be removed faster and more easily than by any other method, and without injury to the thread.

Available for all popular standard tap sizes for 2-, 3- and 4-fluted taps. Write for Cat. No. 120.

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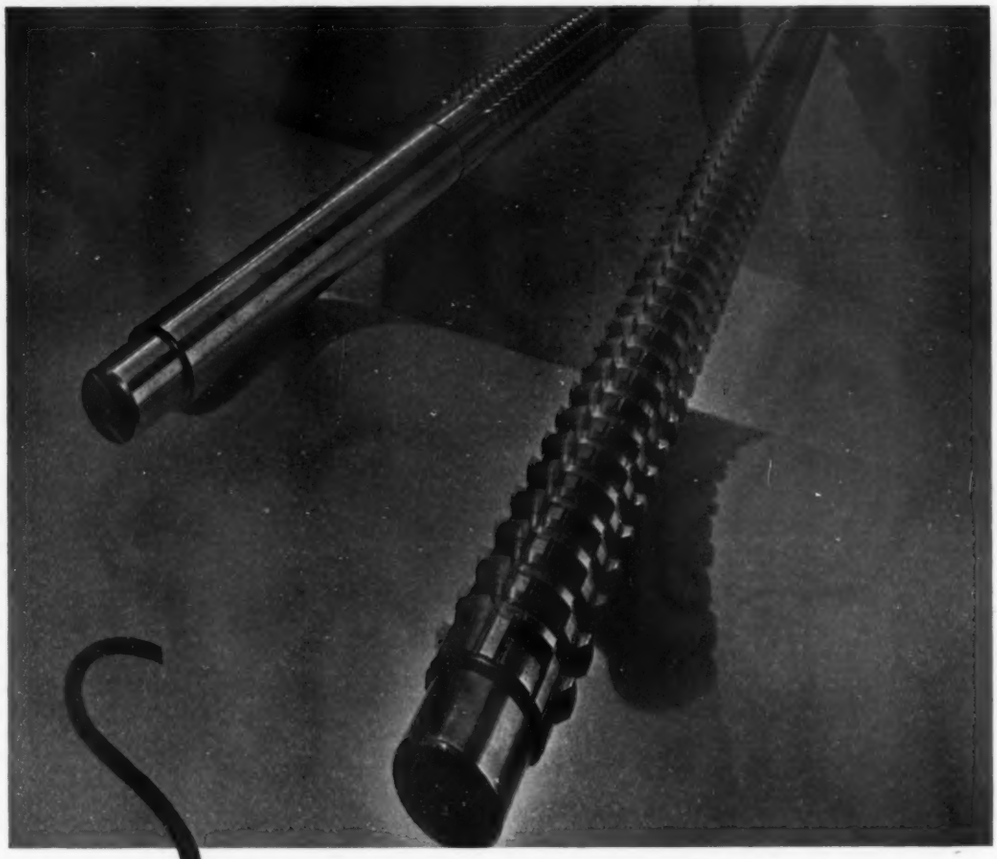

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In plants where production costs are kept to decimal figures, guesses are out. America's leading metal working plants reorder again and again from us because their records show that Durakeen Broaches give them more pieces per grind—more grinds per broach—25% to 35% longer broach life. Try out a Durakeen Broach on your next tough broaching job.

Specify CONNECTICUT DURAKEEN DURABILITY *with* KEENNESS BROACHES

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THE OUTSTANDING LATHE IN THE MEDIUM PRICE FIELD

16" x 6' Gold Seal Lathe—$1,935.00
20" x 8' Gold Seal Lathe—$2,550.00

Including 3 phase motor and all regular equipment as shown. Illustration shows 20" x 8' Gold Seal Lathe built in 12", 14", 16", 18" and 20" sizes.

Due to ease of handling these lathes will take most work and turn it out with speed and accuracy. The outstanding lathe of medium price, quality built throughout. Heat treated and hardened steel gears, exceptionally wide feed and thread range, precision alignment, Timken Bearings in headstock, and made flexible with many new, modern features.

• **THE** lathe in the medium priced field.

52 years of experience

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THE PIONEER MANUFACTURER OF
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Two, Four, Five Spindles • Work and Tool Rotating Types
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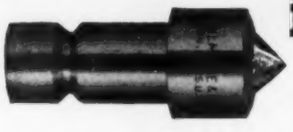

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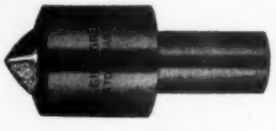

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OFFICES IN ALL PRINCIPAL CITIES
Divisions of GENERAL MACHINERY CORPORATION *Hamilton, Ohio*
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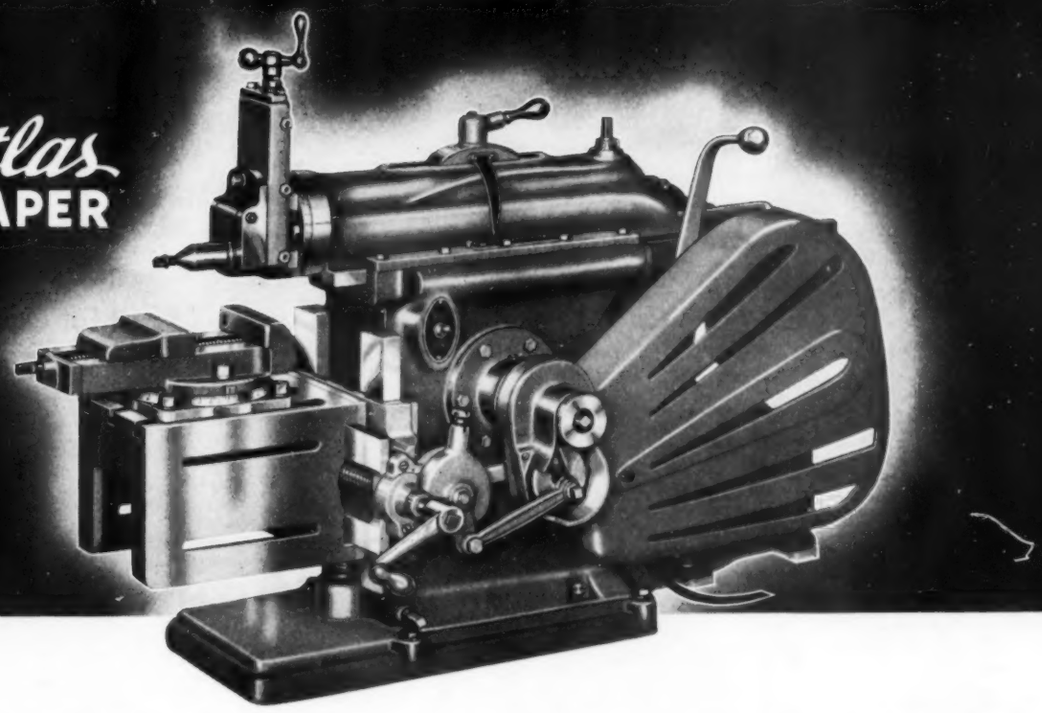
Atlas ANNOUNCES A MODERN PRECISION 7" SHAPER FOR TOOL ROOM AND SHOP

THE Atlas SHAPER



How often in your tool room and shop have you wanted and needed a handy bench shaper, quickly and easily adjusted to shape up a part in a hurry and let you get on with your job with a minimum of fuss and bother? Atlas now provides such a tool in this new 7" Shaper.

Our creative engineers—and they deserve this pat on the back—have done a marvelous piece of work in designing this new machine tool. They've given it the precision, power, and rugged strength of its big brothers, the versatility, the range in speeds, in fact everything you expect to find in a dependable shaper, built down to scale for greater efficiency on small work. And they've done it at a price that sets a new standard of value in metal shapers plus the economy of a half horse-power motor.

Here are just a few performance details. The stroke, of course, goes up to 7". The drive is standard bull gear type powered by V-belts from motor to spindle. 4-step countershaft and pinion-shaft pulleys produce 4 speeds between 45 and 200 strokes a minute. Five surface feeds in either direction range from .005 to .025 inches per stroke. The tool post swivel is graduated up to 50° both ways and the base of the vise can be swiveled and locked the full 180°.

You'll find many ways to put this new Atlas Shaper profitably at work in your tool room and shop. Write today for complete specifications.

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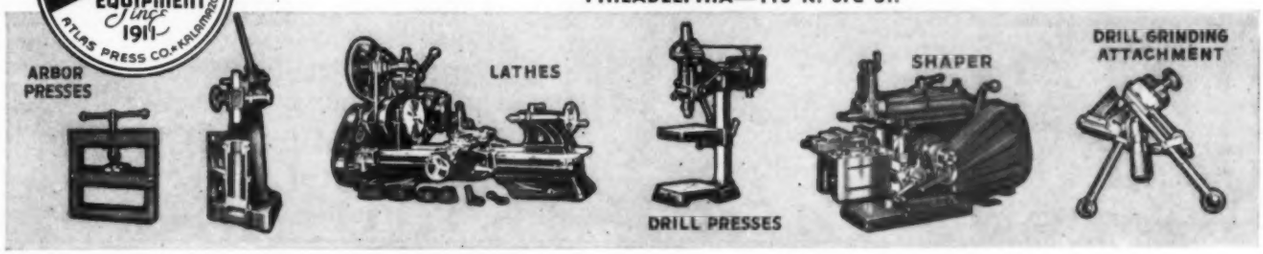
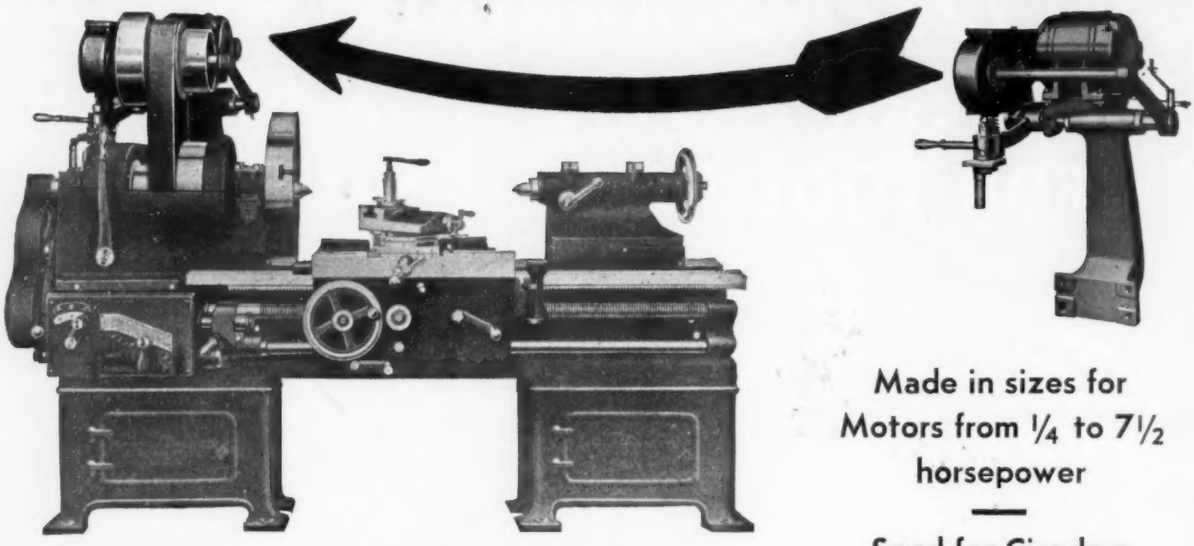


CULLMAN MACHINE TOOL DRIVES



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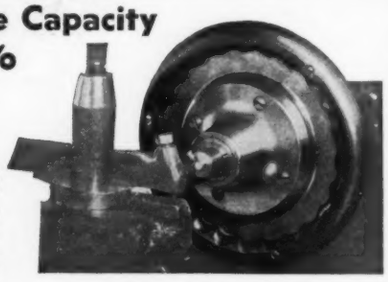

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CRANK SHAPERS
sizes 12" to 32" stroke
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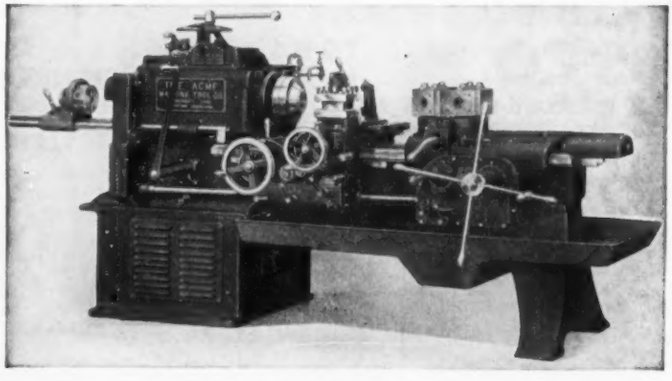

CINCINNATI ACME
Way Type UNIVERSAL
TURRET LATHE

A powerful rigid machine for a wide range of accurate bar and chuck work.

Write for details or send blue prints of your work.

THE ACME MACHINE TOOL CO.
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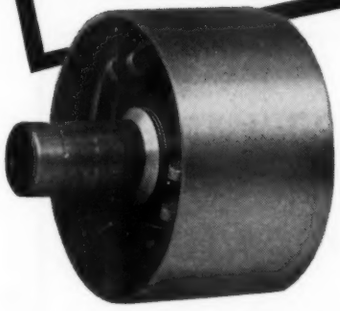
20,000 PULLEYS A YEAR!

with GISHOLT SIMPLIMATICS



The machining of these 13" x 6½" belt pulleys takes only 11 minutes from floor to floor and includes these operations: Turn and face hub outside diameter—turn outside diameter and crown—turn and face rim—cut snap ring groove in hub.

● If it's speed and low cost production you're looking for, then look to the Gisholt Simplimatics. Here's a nationally known manufacturer that knows the economy of modern equipment and modern methods. Two operators, tending four Gisholt Simplimatics, turn out belt pulleys to the tune of 20,000 a year. They do it with less effort, in less floor space, in less time than is possible by any other method. This high production economy is made possible by these outstanding features, found only in Gisholt Simplimatics:

★ The design of the machine which permits simultaneous cutting of all possible surfaces of the piece being machined.

★ Heavy, rigid construction to withstand the pressure of multiple tooling without vibration or distortion.

★ Maximum tool life because the tools are rigidly supported with a minimum overhang. Tools are held in blocks on adjustable slides which bring the tools close to the work.

★ Ease and simplicity of operation—no physical effort on the part of the operator. One operator can tend two or more machines.

★ Simple, automatic high production lathe combining dependability with low maintenance cost.

Any Gisholt man will gladly explain the cost-saving features of these new Gisholt Simplimatics. An interview may lead to the saving of many thousands of dollars.

GISHOLT

GISHOLT MACHINE COMPANY

1201 EAST WASHINGTON AVENUE, MADISON, WISCONSIN, U. S. A.

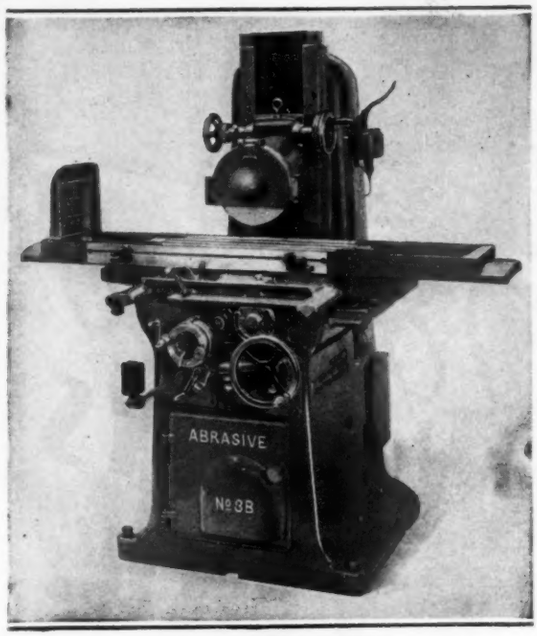
TURRET LATHES • AUTOMATIC LATHES • TOOL GRINDERS • BALANCING MACHINES

There Is No Substitute for Economical Production

The ABRASIVE No. 3B Surface Grinder is successfully maintaining its reputation for low-cost, high quality production in the face of keen competition.

Costs are not based on one or two spectacular demonstrations conducted under ideal conditions. Real costs are those which are determined over a period of time, and based on actual shop conditions. These are the conditions under which we do not fear to place the No. 3B.

To our minds, the cost of removing stock to close tolerances is still the controlling factor in the purchase of Surface Grinders.



Capacity—24"x8"x12"

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Keep production on its toes by standardizing on . . . VITRIFIED GRINDING WHEELS

The Vitrified complete line includes also Silicate, Shellac and Resinoid bonded wheels for conditions requiring high finish, elasticity and heat resistance.

Grinding equipment—for tools or for production requirements—can be brought to higher degrees of precision and speed by standardization of Grinding Wheels.

These objectives can easily be realized through the use of Vitrified Wheels for every grinding operation, because Vitrified offers a complete line of sizes, shapes and types, processed especially for the work to be handled.

. . . Cast Iron, Bronze, etc., can be ground at low cost and efficiently on Vitrified Carborite Wheels.

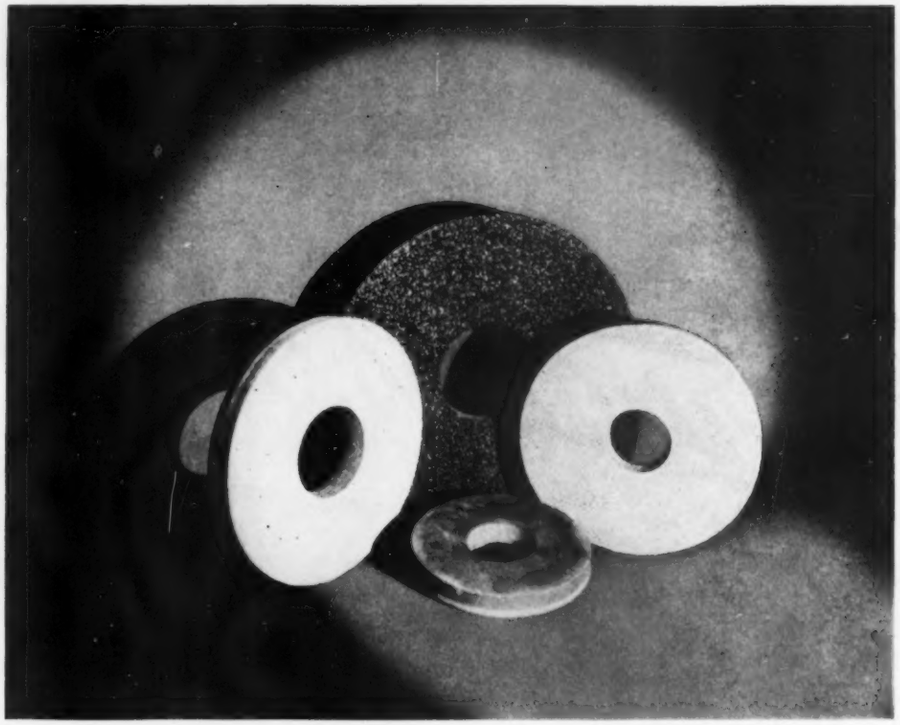
. . . for accurate, fast grinding of steel on a production basis, Vitrified Borite Grinding Wheels increase output and reduce costs.

. . . Also, make Silicate, Shellac and Resinoid Bonded Wheels.

Ask a Vitrified representative to show you how economically you can modernize your grinding operations by standardizing on Vitrified Wheels.

Vitrified Wheels

VITRIFIED WHEEL CO.
WESTFIELD MASS.



Get the MOST *for your* ABRASIVE DOLLAR!

YOU do that when you buy your Disc Grinding Abrasives from a Disc Grinder Builder!

For, more than the actual wheel itself, you get the benefit of distinctive, well-rounded experience, PLUS fingertip control of materials and methods, built right into the wheel, you might say. An intangible value, to be sure, but one which is definitely reflected in the results you obtain!

The man who makes abrasives alone, has only half the story—he lacks much first-hand knowledge of machine conditions and requirements. And he who builds grinders and offers you abrasives made elsewhere, cannot possess that firm control of manufacturing processes and methods which alone will insure a completely efficient product.

GARDNER operates the only factory in this country, devoted exclusively to the manufacture of BOTH *Disc Grinders and the abrasives used upon them!*

Write for our 16-page Booklet—
"GARDNER ABRASIVE PRODUCTS"!

GARDNER MACHINE COMPANY

410 East Gardner Street, Beloit, Wisconsin, U. S. A.

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The grinding wheels that are increasing production, improving quality and lowering operating costs throughout the metal working industry

BILLET Grinding . . . Roll Grinding . . . Snagging . . . All types of rough and precision grinding . . . Polishing. Every day on the production lines of great plants throughout the metal industry abrasives by Carborundum are proving they can increase production, improve quality, produce better finishes (where finish is a factor) and reduce costs. Visit the National Metal Congress and Exposition and see the complete line of Aloxite Brand Aluminum Oxide Wheels and Polishing Grains, and Carborundum Brand Silicon Carbide Wheels. "Carbofrax", the Carborundum Brand Silicon Carbide Super-Refractories for various high temperature installations in the metal working field, will also be on display.

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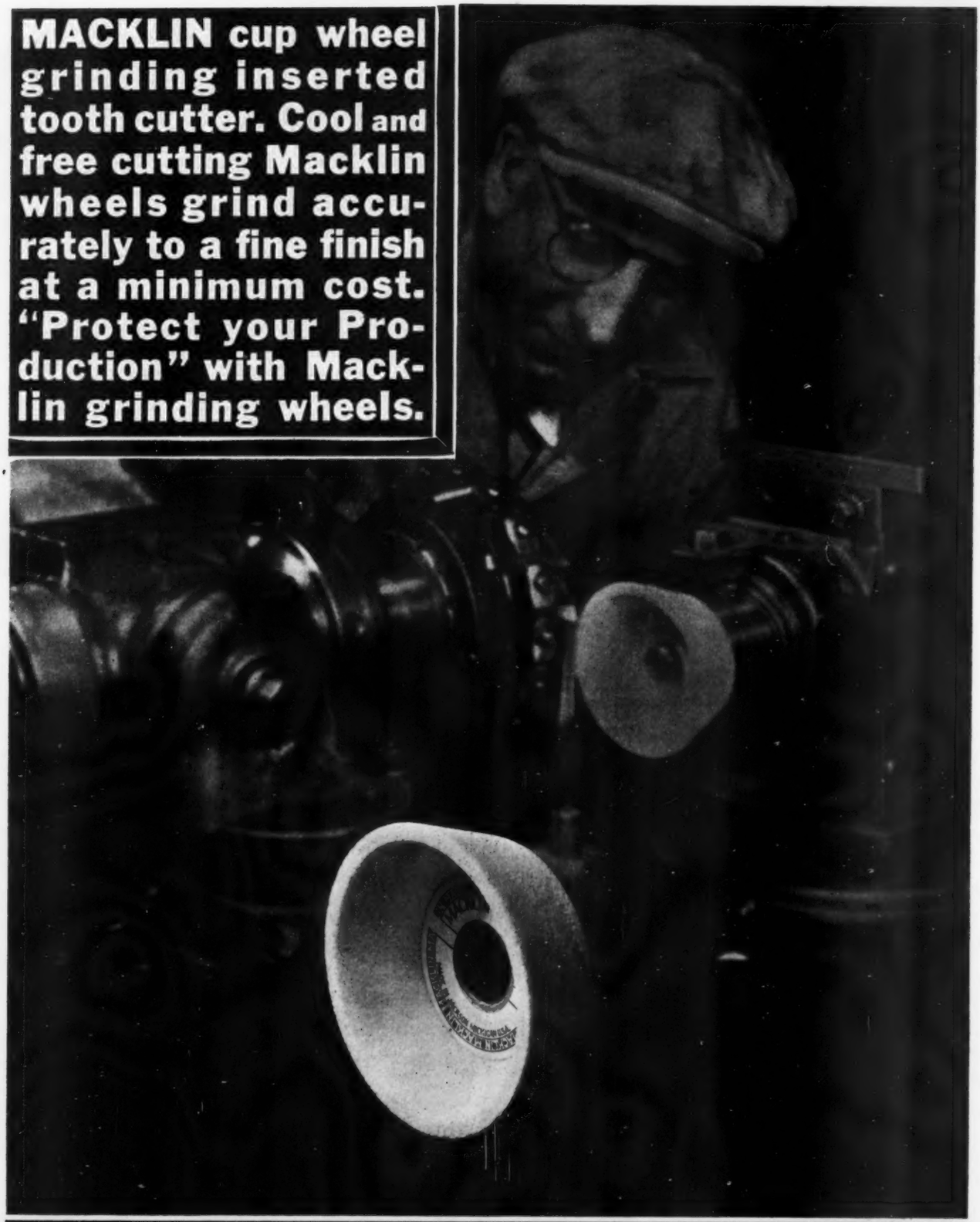
(Carborundum, Aloxite and Carbofrax are registered trade-marks of The Carborundum Company)

MACKLIN cup wheel grinding inserted tooth cutter. Cool and free cutting Macklin wheels grind accurately to a fine finish at a minimum cost. "Protect your Production" with Macklin grinding wheels.



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Manufacturers of GRINDING WHEELS—JACKSON, MICHIGAN, U. S. A.

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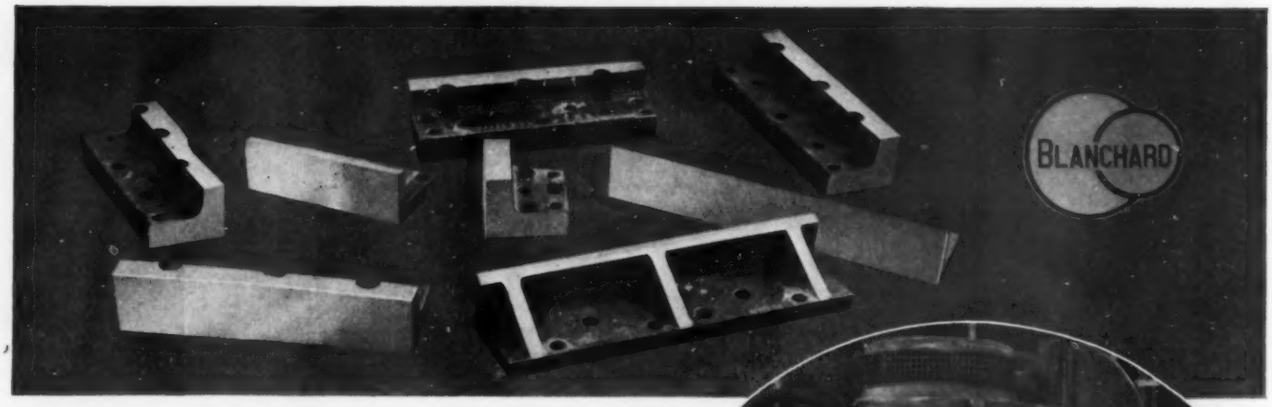

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in great variety ground with speed and safety . . . . .

Speed—because a variety of work can be quickly handled without loss of time between jobs.

Safety—fast grinding without burning die, because of high work speed—ample water supply—and ability to use soft free cutting wheels.

The pictures show the No. 18 Blanchard Surface Grinder, with power traverse of table, waterguards opening at front, and push button control for all motions. Descriptive catalog will be sent on request.

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64 State St.,

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..a complete line

Get the MARVEL answer to your metal cutting problem

New development in metal sawing machines and new unbreakable composite hack saw blades have changed old rules, cutting speeds, blade tensions, and feed pressures—have made obsolete old cost figures, output figures and cutting off methods. These new fundamental developments and the equipment that embodies them are products of MARVEL Engineers, are unique to MARVEL Sawing Machines. For this reason, whatever your metal cutting problem the MARVEL answer is certain to be the best and final answer.

MARVEL offers a complete SYSTEM for metal sawing —a complete and revolutionary line of modern equipment all the way from the positively unbreakable MARVEL High-Speed-Edge Blades through all the various sawing machines, each particularly adapted to individual sawing jobs and requirements.

MARVEL sales engineers, located in all the large industrial centers, are competent to render consulting engineering service on all cutting off problems—on request will call, analyze your work and make recommendations for the most efficient sawing equipment and methods for your particular range of work and production requirements. This service is given without obligation or cost.

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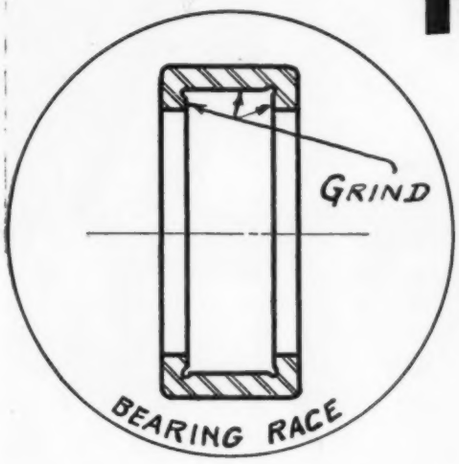
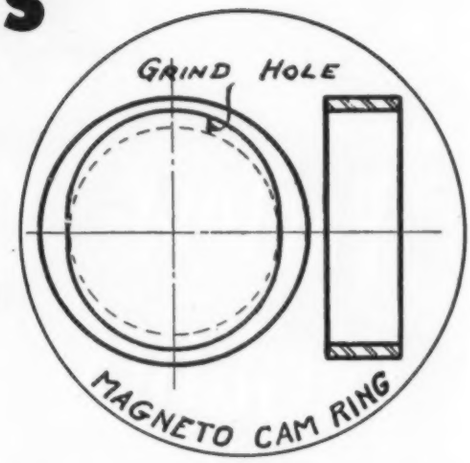
"The Hack Saw People"
CHICAGO . . . . . U. S. A.

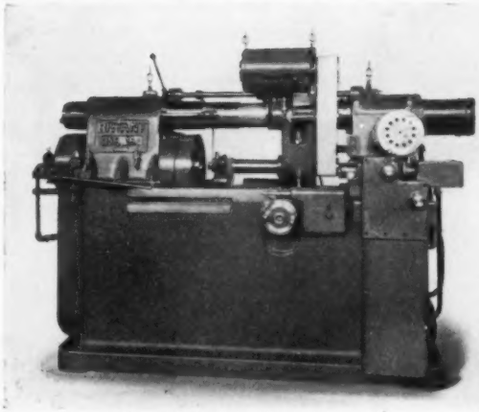
Holes



ALL TYPES
ALL SIZES
GROUND ON



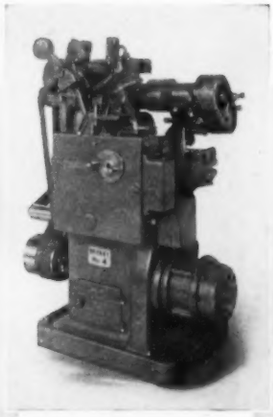
BRYANT GRINDERS



No. 16 Bryant Grinder

For Medium Size Work

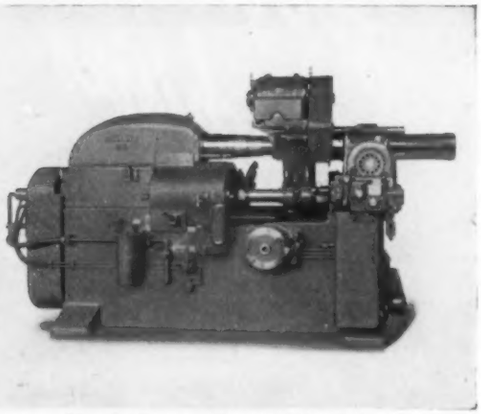
Furnished in three sizes: 16–16″ swing, 16–28″ swing, 16–38″ swing. Also two spindles for hole and face grinding, No. 16-A.



No. 4 Bryant Grinder

For Small Work

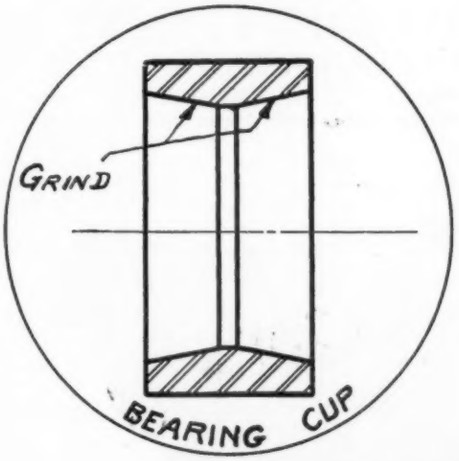
No. 4 with automatic sizing. No. 5 without automatic sizing. No. 5-B with adjustable work head for grinding steep tapers. No. 5-A with two spindles for hole and face grinding.



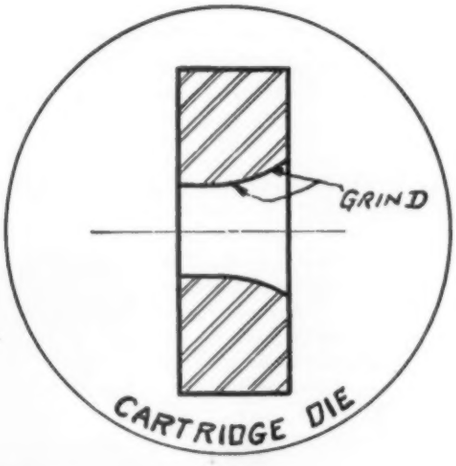
No. 24 Bryant Deep Hole Grinder

For Large Heavy Work

Furnished in two sizes: No. 24–21″ swing, No. 24–31″ swing.

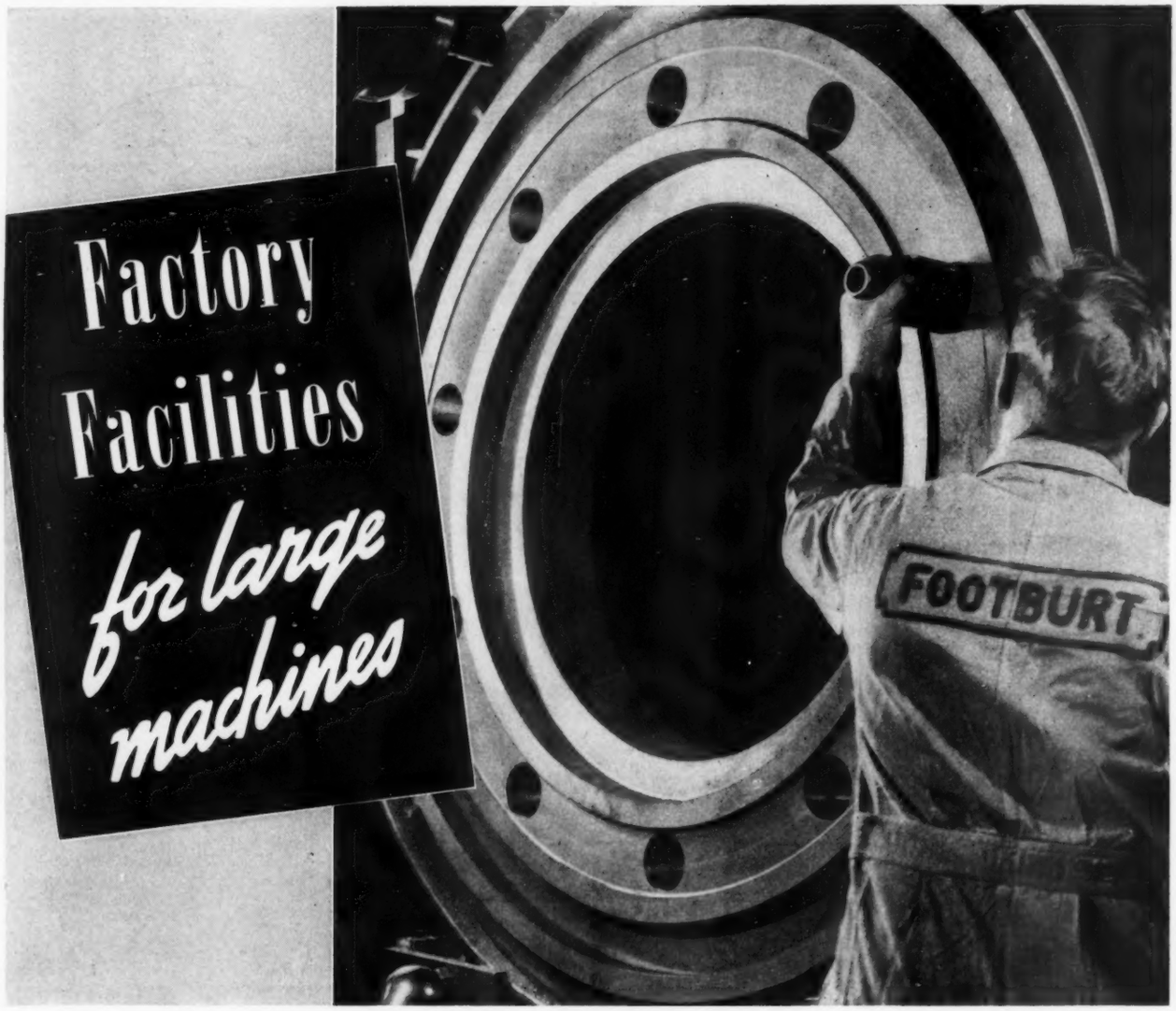


BRYANT
REG. U.S. PAT. OFF.



BRYANT CHUCKING GRINDER CO.

Springfield, Vermont, U. S. A.



When you need machines for special work, Footburt is equipped in experience and personnel, as well as plant facilities, to supply them.

Standard units provide the means of building special drilling, boring, tapping and surface broaching machines at a reasonable price.

We will be glad to work with you on your machinery problems. Just send us your blue prints and production requirements.

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CLEVELAND, OHIO

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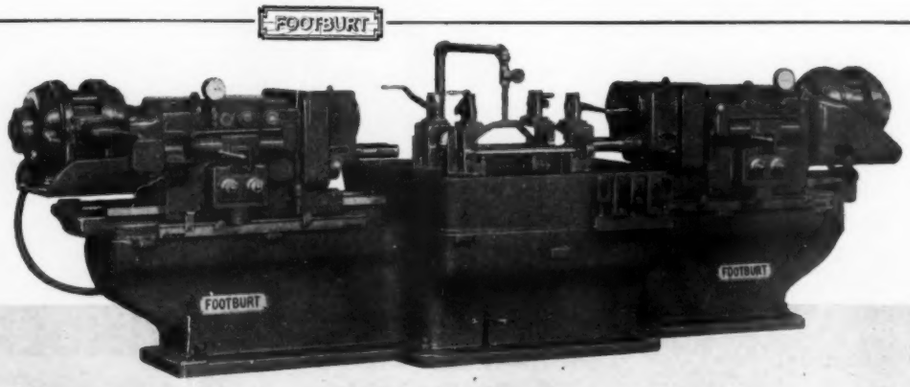
FOOTBURT

Two-way hydraulic feed drilling machine with indexing table for drilling holes in opposite ends of steel turnbuckles.

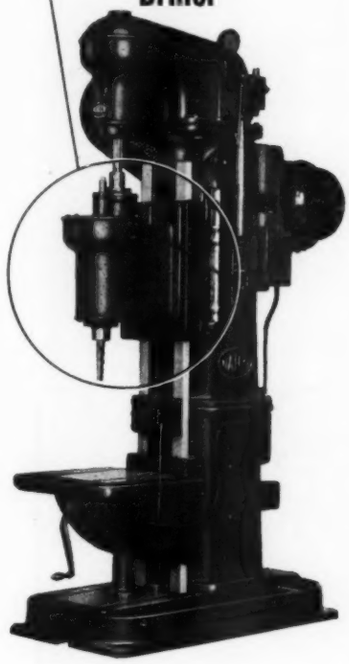


NATCO B-225H

For Rapid Drilling in Small and Medium Sized Work

This Hydraulic Feed Machine Can Be Converted Into 3 Types

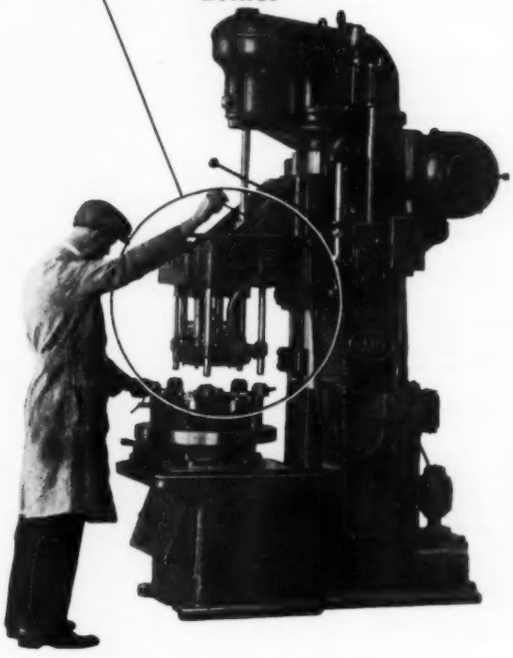
1 Single Spindle Driller



Capacity, One 1½" Drill in Steel

The NATCO Model B-225H machine shown above is equipped with a single spindle slow speed head for boring operations. This type of machine may also be arranged with a standard single spindle head for normal drilling if desired. Equipped with either type of head and complete with an adjustable table, this machine may be used on a wide variety of single spindle work.

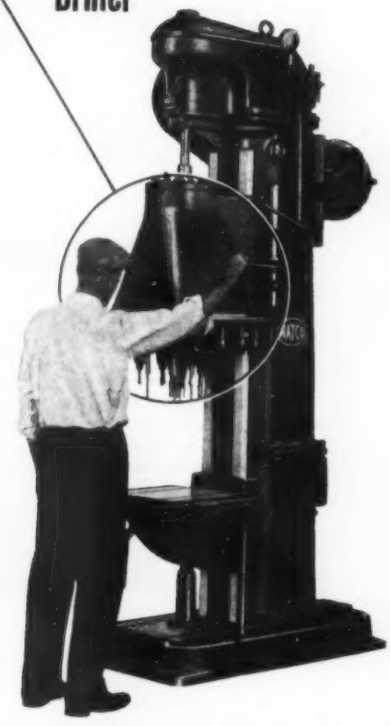
2 Drill Head Driller



Capacity, Sixteen ⅜" Drills in Steel

Equipped with a multi-spindle drill head and a high type solid built in base, this machine may be used on production multiple work. Note the large flat slide which makes possible the mounting of different drill heads as desired.

3 Adjustable Multi-Spindle Driller



Capacity, Sixteen ⅜" Drills in Steel

The NATCO Model B-225H may also be furnished with any one of three different sized adjustable joint driven multi-spindle heads. This machine, when arranged in this manner, can be used on a large variety of work requiring numerous spindle setups.

The NATCO Model B-225H is a medium sized driller arranged with a semi-automatic hydraulic feed. It is just one of the many types and sizes of vertical hydraulic feed drilling, boring and tapping machines which make up the NATCO line. Write for complete information.

Chicago Office—2009 Engineering Bldg.
Detroit Office—409 New Center Bldg.

Investigate NATCO Methods for Lower Production Costs!

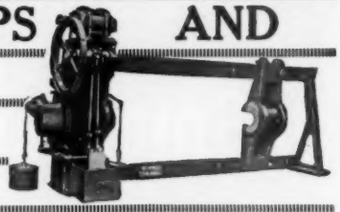
THE NATIONAL AUTOMATIC TOOL CO.
Richmond, Indiana, U.S.A.

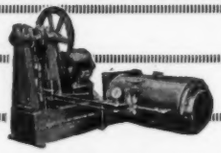
NATCO

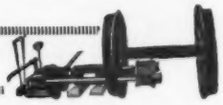
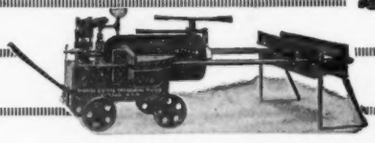
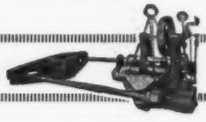
Drilling, Boring and Tapping Machines

HYDRAULIC MACHINERY SINCE 1851 ELMES CHICAGO

PORTABLE PUMPS AND JACKS WHEEL AND FORCING PRESSES ARE THE HANDIEST TOOLS IN THE SHOP MOVE THEM TO THE JOB IT'S DONE IN HALF THE TIME - AT LESS THAN HALF THE COST WE'LL TELL YOU WHY - WRITE





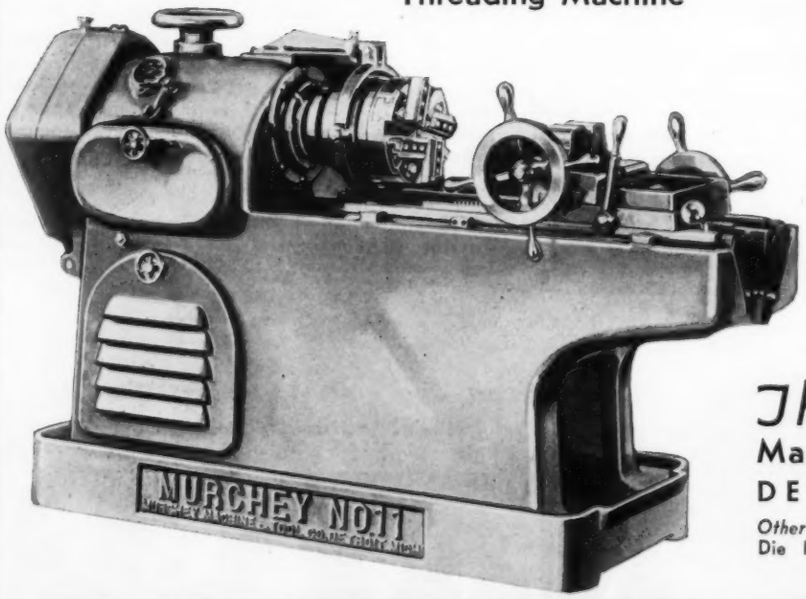
THE CHARLES F. HYDRAULIC MACHINERY SINCE 1851 ELMES CHICAGO ENGINEERING WORKS

Telephone: Haymarket 0696

1001 Fulton St., Chicago, U. S. A.

SPEED with PRECISION *in* Modern Thread Cutting

Murchey No. 11 and No. 22 Threading Machine



Here's a real money-saver for producers of threaded parts ranging from 1/8" to 2" in diameter. Every possible convenience is provided for handling a wide variety of work with utmost speed and precision.

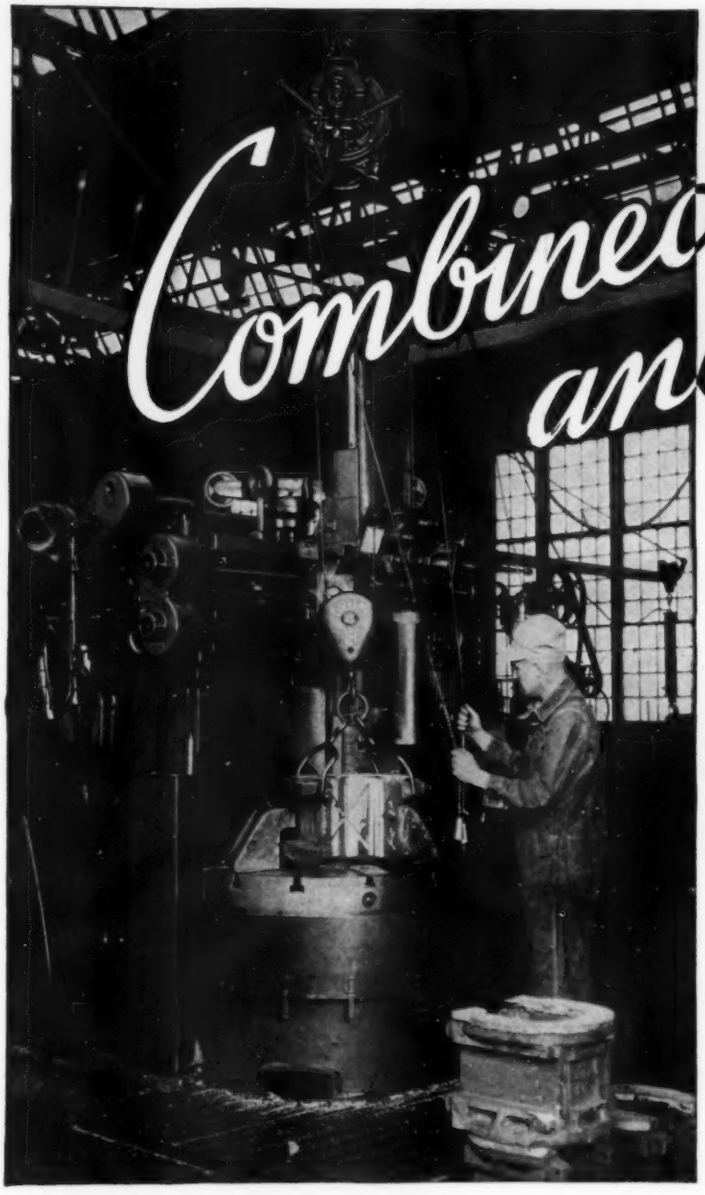
Spindle speed can be varied between 48 and 563 r.p.m., by merely turning a hand wheel; while a visual indicator shows clearly the exact speed at which the spindle is turning over.

Murchey Tangent Chasers give cool, free-cutting action—greater production, better quality and large reduction in costs.

Write today for bulletin giving complete information. Tell us also about your thread-cutting requirements and conditions. Our engineers will be glad to estimate probable savings through use of these modern high-production machines.

The MURCHEY Machine & Tool Company DETROIT MICHIGAN

Other Products: Collapsible Taps, Self Opening Die Heads; Double End and Pipe Cutting-Off Machines



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REDUCE SHOP COSTS

Ease of Handling Speeds Operations

This Ingersoll-Rand Air Motor Hoist, serving a vertical turret lathe, speeds up production and effects a big saving in cost.

The absolute safety of the Ingersoll-Rand Air Motor Hoist combined with its smooth positive performance gives the machine operator full confidence in his work—which he performs with ease—cutting handling costs to a minimum.

The automatic safety down-stop, the automatic safety up-stop, and the automatic brake insure positive handling of the load at all times. The graduated throttle provides a simple, smooth control and the operator easily transfers the load without jerk or danger of upsetting. Lubrication is automatic. The hoist cannot be damaged by overloading as the air motor merely stalls.

I-R Air Motor Hoists are made in nine sizes—capacities from 500 to 20,000 pounds. They will speed up your shop operations and materially increase the output of your machines.

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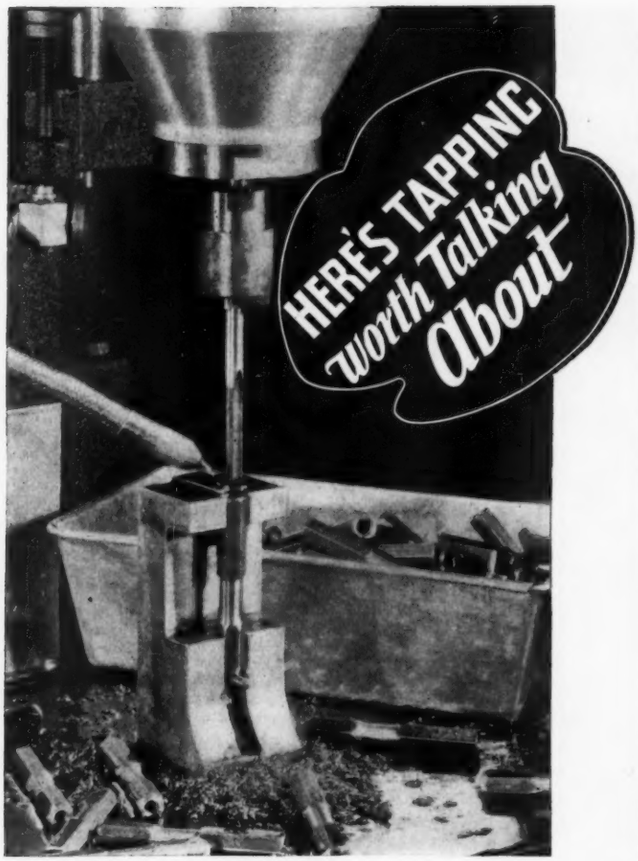
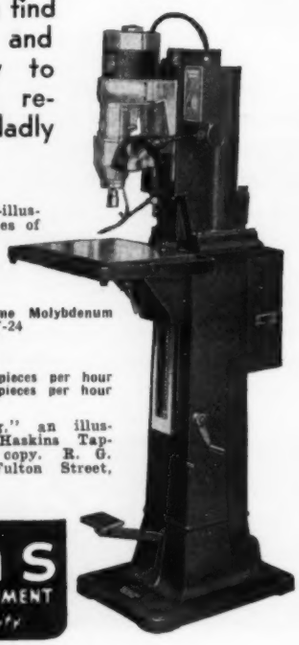
Tulsa
Washington



Tapping a hole in Chrome Molybdenum 1⅛" deep—close to bottom—holding to very close limits. With a net production of 350 pieces per hour.

A hard and highly abrasive material. Tough going for any tapping machine. You can see how The Haskins Tapper whipped the job. Everywhere tough jobs are being done in less time and with less effort by the Haskins Method. Everywhere Haskins engineers are helping manufacturers find the fastest, simplest and least expensive way to meet their tapping requirements. They'll gladly do the same for you.



PRODUCTION LINE PROOF—illustrated above is No. 85 of a series of case histories showing tough jobs made easy — done better and faster—by the Haskins Method.

Material	Chrome Molybdenum
Size of Tapped Hole	5/16"-24
Depth of Tapped Hole	1 ⅛"
RPM of Tap "in"	875
RPM of Tap "out"	1750
Production—1st operation	750 pieces per hour
Production—Net-2 operations	350 pieces per hour

"High Speed Precision Tapping," an illustrated booklet, describes the Haskins Tapper in detail. Write for your copy. R. G. Haskins Company, 4630 W. Fulton Street, Chicago.

Haskins
Hi-Speed TAPPING EQUIPMENT
with Greater Adaptability

DO YOU WANT SOME EXTRA MONEY?

You can have extra money by conducting a business of your own in your spare time

You need no capital, no special sales experience, only a little of your spare time and we will start you in a profitable business.

You can make as much as a day's pay in one hour of your spare time by acting as our representative in the sale of the

AMERICAN MACHINISTS' HANDBOOK

The book sells on sight.

Every man in your shop and other shops will find this practical Handbook as useful as any tool in his kit. Other men in large and small shops have successfully sold thousands of copies of the Handbook with profit to themselves

Seventeen men who recently accepted our spare-time plan, made an initial profit of $142. They expect to continue adding profits.

Here is the plan

This 6th edition of the **American Machinists' Handbook** will be wanted by the thousands of machinists, toolmakers, draftsmen, apprentices, in fact, anyone connected or dealing with machines. This book does not need to be sold, it sells itself.

You can have the agency for your shop and get a liberal commission on every book you sell.

Without obligation to you and for the cost of a three-cent stamp you can have full details of the plan and information regarding the advertising literature sent FREE in order to help your sales. ***Send the Coupon now.***

MONEY-MAKING COUPON

McGraw-Hill Book Co., Inc.
330 W. 42nd St., New York

Please send me without cost or obligation to myself, your plan by which I can profitably turn my spare time into money.

AMERICAN MACHINISTS' HANDBOOK

Signed .....

Address .....

Company .....

Position .....

A10-6-37

Recognized

The distinctive gold colored Victor "Moly" hack saw blade is widely recognized as the blade that cuts fastest, lasts longest and costs least.

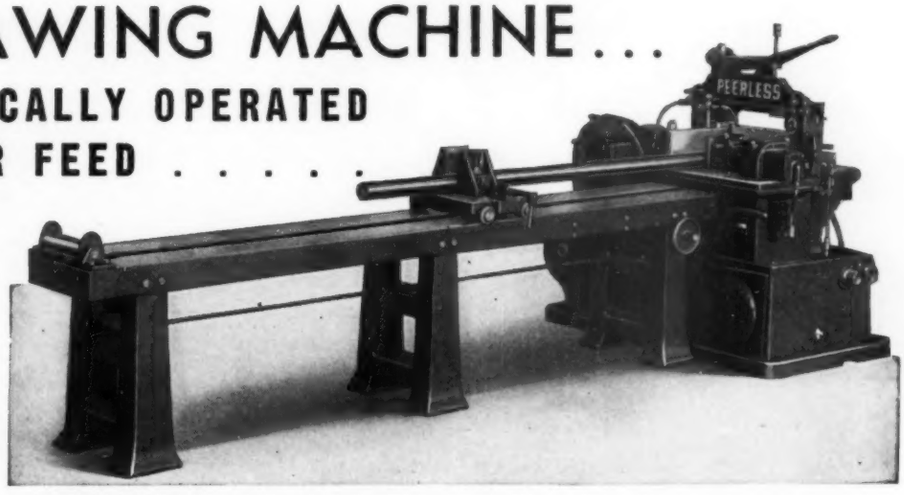
Used

Victor "Moly" has become the widely accepted hack saw blade. Sold only through established distributors.

Victor — Victor Hack Saws — Wins on Merit

VICTOR SAW WORKS, INC.
MIDDLETOWN, N. Y.

NEW 6" x 6" Peerless Improved High Duty
METAL SAWING MACHINE...
WITH HYDRAULICALLY OPERATED AUTOMATIC BAR FEED . . . . .



Automatically feeds the bar of stock forward to the gauge, automatically closes the vise, and automatically continues to repeat the complete cycle of cutting until the entire bar is cut to the length the gauge is set for, all without the attention of an operator.

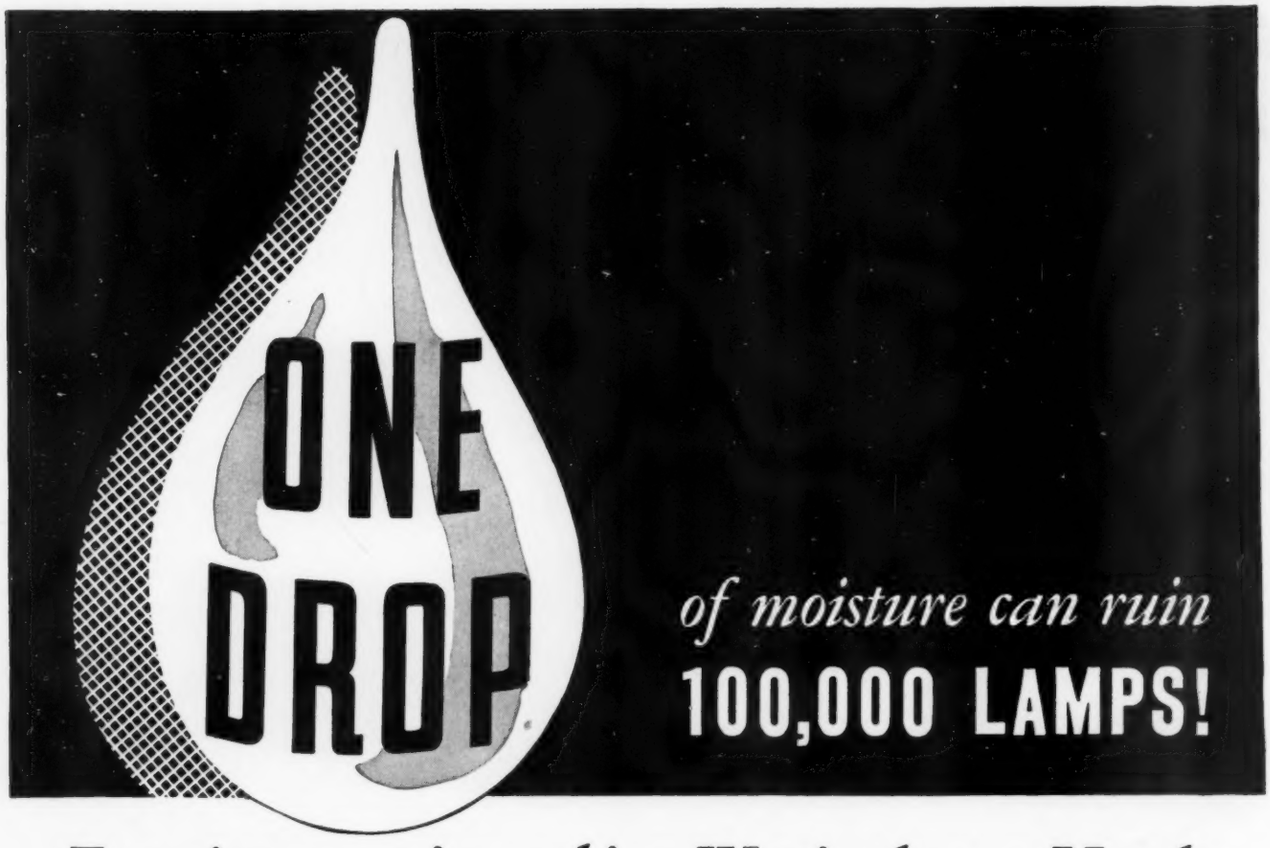
The three speed sliding gear transmission—crankshaft—balance lever and trunnion blocks are fully ball bearing equipped.

The fastest cutting time possible at a minimum blade cost on any kind of metal because of its modern design and rigid construction. Also furnished without automatic bar feed.

Also—Peerless Improved Universal Type—Standard Type and Vertical Type in various sizes for fast production sawing.

Write for complete literature

PEERLESS MACHINE COMPANY
RACINE WISCONSIN



Exacting care in making Westinghouse Mazda Lamps . . . means MORE LIGHT—LONGER

It takes only 1/100,000 of a drop of water inside a lamp to blacken it—a single drop can cut the efficiency of one hundred thousand lamps! No wonder, then, that Westinghouse takes unusual precautions to guard against moisture—the gas pumped into every bulb is processed to remove every trace of it, and the glass bulb itself is heat-treated to drive out whatever small amount of moisture there might be on its surface.

These elaborate precautions—and hundreds of others—make Westinghouse Mazda Lamps the most economical sources of electric light you can buy—because they give you more light—longer.

Over 480 tests and inspections of materials and processes go into the making of every Westinghouse Mazda Lamp. If any one of these tests or inspections were omitted, the quality of the lamp might be impaired. When you see the Westinghouse trade-mark on a Mazda lamp, you know that it is the best lamp science and engineering skill can make.

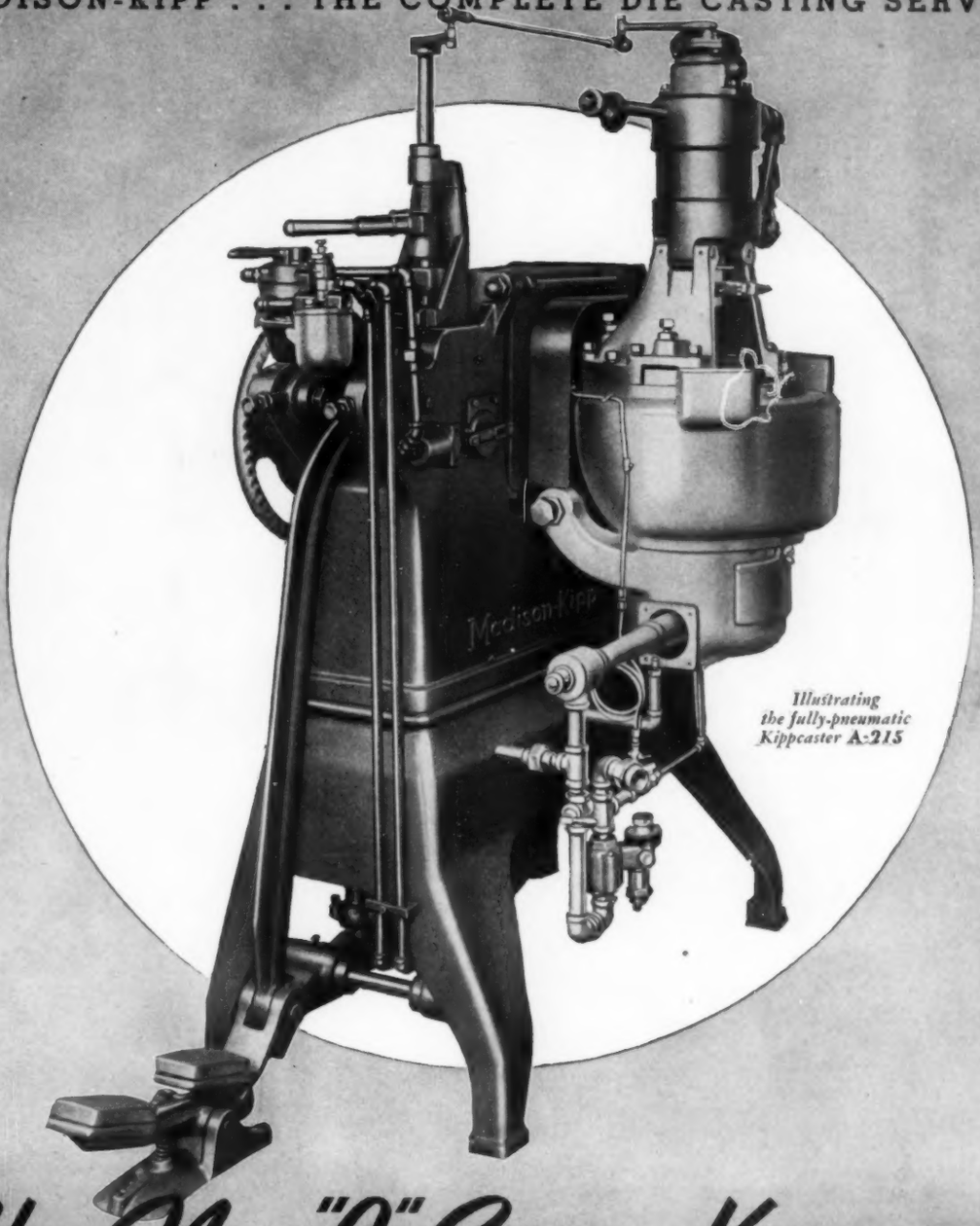
HOW TO JUDGE A LAMP

Lamps differ in quality. Inefficient lamps waste current and increase the cost of light. Our free booklet, *"How to Judge a Lamp"*, tells the important points to consider when buying lamps. Send for it today. Westinghouse Lamp Div., Westinghouse Elec. & Mfg. Co., 150 Broadway, New York, N. Y.

Westinghouse makes no compromise with quality

Westinghouse MAZDA LAMPS

MADISON-KIPP . . . THE COMPLETE DIE CASTING SERVICE



Illustrating the fully-pneumatic Kippcaster A-215

The New "A" Series Kippcaster

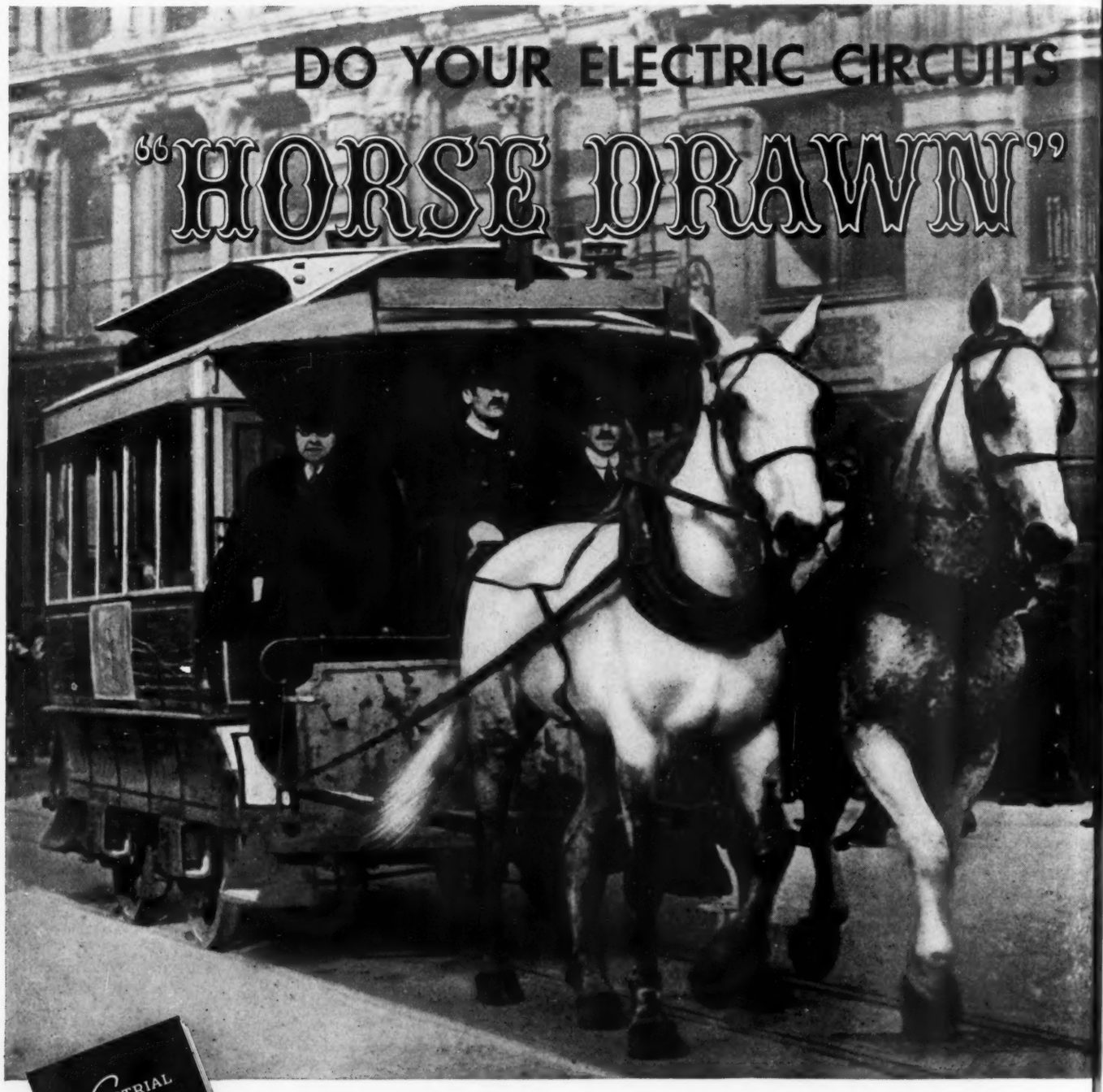
• BIGGER • FASTER • MORE POWERFUL • EASIER TO OPERATE

RARELY has one Kippcaster been installed in a plant for a year's time, that a 2nd, 5th, 10th or 20th has not been added in quick succession —because the economy of Kippcasting breeds more and more die cast parts. And now the new "A" Series of these inexpensive units have greater die capacity (for larger and more complex parts), more power, wider guide bar spread and ram speed control; so that with reduced effort the casting cycle is faster. Come to Madison to see for yourself or send samples and blue prints for a complete analysis.

Sole Agent in England: Wm. Coulthard & Co., Ltd., Carlisle
Sole Agent in France: Fenwick Ste. Ame., Paris

MADISON-KIPP CORPORATION
201 WAUBESA ST. MADISON, WISCONSIN U.S.A.

DO YOUR ELECTRIC CIRCUITS "HORSE DRAWN"



How to find what's wrong with your plant's electric circuits

Our "Industrial Wiring Survey" tells you how to initiate a scientific check-up of electrical circuits. It simplifies the problem surprisingly.

Our "Industrial Guide for the Selection of Wire and Cable" tells how to correct the trouble.

Brand new, it is the only thing of its kind in the electrical industry. Scores of situations are described and an engineering recommendation is given for the correct wiring solution of each. These books are free. Send for your copies.

ANACONDA
from mine to consumer

Anaconda

General Offices: 25 Broadway, New York

DATE FROM THE DAYS?

Perhaps not . . . yet chances are they're antiquated enough so that power is being wasted every hour of the day. New, improved cables will save money . . . repay their cost many times over. Let us tell you how to make a check-up without cost!

YOU can see a leaky water pipe. But you can't always detect an electric circuit that is wasting power. And the tragedy is that *most* factory circuits are wasting current needlessly. Estimates show that *in 9 out of 10 industrial plants, important savings could be made by bringing antiquated, outworn circuits up to date!*

Sometimes, deficient circuits reveal themselves in breakdowns. Men and machines stand idle. Products in process spoil. Dollars fly out the window every hour until repairs are completed.

More often, the losses aren't so easily detected. Perilous overloads cause heat losses. Power "evaporates" invisibly. Maintenance and repair bills are considerably higher than they should be.

Safeguara your plant

Do something today to safeguard your plant against these dangers. Have a check-up of electric circuits made. Such a check-up will cost you nothing. It may save thousands of dollars.

The two books shown at the left give you everything you need for a study of your plant's wiring. New, informative, they are being used by hundreds of manufacturers. Send for them today. If you have a specific problem in mind, consult our Engineering Department. We will be pleased to cooperate without obligation.

Here is an Anaconda cable that has a remarkable record of continuous performance without a single reported failure. *Duracode* was recently specified for use in the world's largest strip mill.

• • •

The outstanding characteristics of this Anaconda cable are: 1. Its remarkable stability. This has been demonstrated by accelerated aging and other tests as well as by use in the field. 2. The compound is highly resistant to moisture, acids, and alkalies. 3. Low susceptibility to combustion and explosion. 4. Its heat-resisting characteristics permit large emergency overloads.

• • •

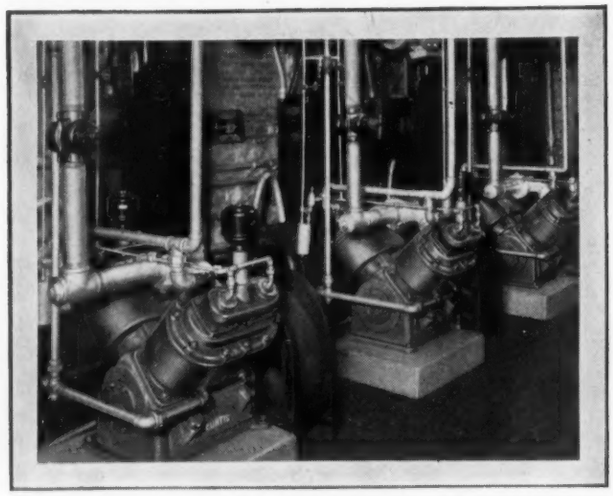
It pays not only to install adequate wiring but to use *modern, improved* types of cable like this one. Make sure that you are getting the benefit of the tremendous strides in cable manufacture. Specify Anaconda . . . where standards are being improved constantly. 37542

Write for data on DURACODE

Wire & Cable Company

Chicago Office: 20 North Wacker Drive • ***Sales Offices in Principal Cities***

Pay less for air with Curtis Compressors



Compressor installation at Carter Carburetor Corporation, St. Louis, Mo.

Curtis Compressors Give You:

- Maximum capacity per dollar of first cost
- Highest volumetric and mechanical efficiency
- Maximum output per unit of power
- Lowest maintenance and oil consumption

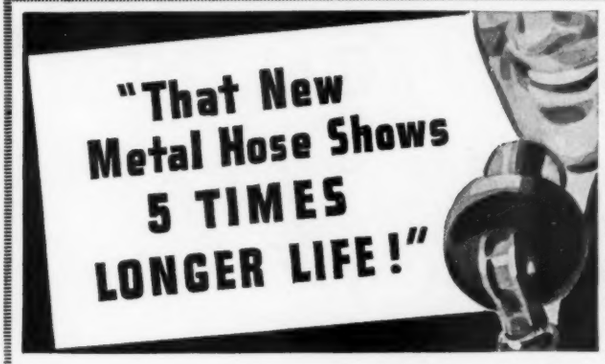
The result is a dependable compressed air supply at minimum cost. This outstanding economy—plus *dependability* — reflects Curtis' 83 years' experience and 43 years' specialization on the manufacture of compressors, as evidenced by such features as:

CENTRO-RING OILING — Positive pressure.
TIMKEN ROLLER BEARINGS — Friction minimized — adjustable for wear.
CENTRIFUGAL UNLOADER — For automatic no-load motor starting.
Carbon-free disc valves • Fully enclosed crankcase • All parts readily accessible • Capacities up to 360 CFM.

Ask for Bulletin C4B

CURTIS PNEUMATIC MACHINERY CO.
1924 KIENLEN AVE., ST. LOUIS, MO.
New York • Chicago • San Francisco

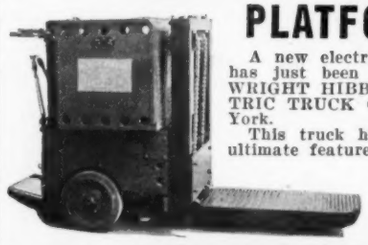
COMPRESSORS • AIR HOISTS • I-BEAM CRANES AND TROLLEYS



There's a Reason Why REX-WELD *Outlasts Other Hose*

• This new type jointless metal hose is fabricated from strip by exclusive new process of autogenous welding and "50-50" principle of tube corrugation—producing a stronger, more flexible, longer wearing hose—balanced strength units which provide maximum strength with minimum weight and cost. Send for Rex-Weld's record of performance and economy! **Chicago Metal Hose Corporation, Maywood, Illinois (Chicago Suburb).**

The NEW WRIGHT *smallest* ELECTRIC LOW-LIFT PLATFORM TRUCK



A new electric high lift platform truck has just been recently developed by the WRIGHT HIBBARD INDUSTRIAL ELECTRIC TRUCK COMPANY of Phelps, New York.

This truck has been designed with the ultimate feature of compactness in overall dimensions. The overall length of the truck with a 42" long loading platform is 89" and the overall width is 28½" with the average size of battery required.

Another desirable feature is the type of lift which is by means of a pair of steel roller chains insuring maximum efficiency in power consumption and long life of the lifting mechanism. This truck with loading platform of 18" up to 28" wide and from 34" up to 53" in length and from 6½" high to 11" high in low position and a maximum lift of 72" from the floor.

Full details are described in our new folder number 5 which may be had by addressing the company direct.

Note WRIGHT Truck in operation in a narrow aisle inside plant—a big pay load in small space.

WRITE FOR CATALOG NO. 5

WRIGHT-HIBBARD
INDUSTRIAL ELECTRIC TRUCK CO., INC.
PHELPS, NEW YORK

STRAIGHTEN

Your Coiled Stock Automatically

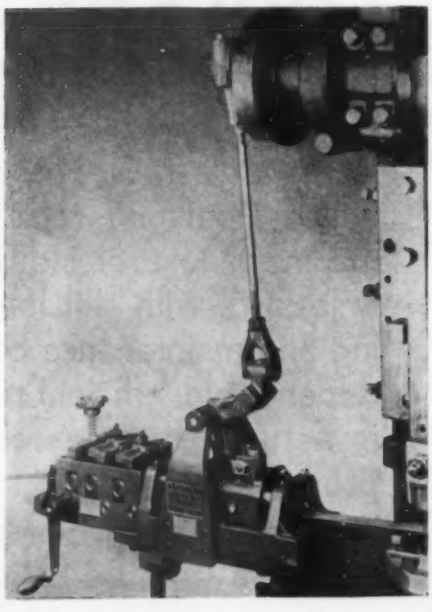
U. S. Power Driven Straightener

WITH THESE

HEAVY DUTY U. S. STRAIGHTENERS

PRODUCTS

U. S. Slide Feed and Stock Straightener



The new U. S. Power Driven Straighteners enable you to change over to coiled stock on jobs formerly requiring short mill flattened strips. These improved heavy duty straighteners will flatten your stock equal to any commercially flattened strip . . . and they enable you to feed continuously and automatically . . . cutting productive labor costs, speeding production and reducing stock waste.

Whether your coiled stock is .005" or 1/4" thick there is a U. S. Straightener to save you money. For light stock U. S. Straighteners are furnished to mount directly on U. S. Slide Feeds, driven from the punch press . . . providing a most economical accurate straightening and feeding unit.

Investigate these new developments in automatic equipment for handling stock from coil to finished part.

Send for Literature

U. S. TOOL COMPANY, Inc.

AMPERE, EAST ORANGE, N. J.

SAVE TIME . . cut costs and do a better job with *the* . . .

HARTFORD TRIPLE-ACTION CUTTING BARREL

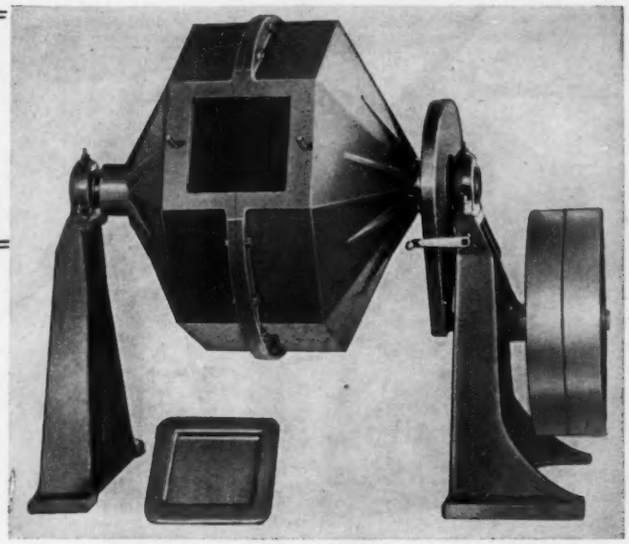
• This recent development by Hartford engineers offers outstanding advantages over hand finishing operations.

A multiple, quick grinding action is produced by the unique shape of the barrel. Material is turned over and over, end to end, and folded in by a TRIPLE ACTION which grinds off burrs and finishes and smooths the surface of every article in the load.

The new HARTFORD Cutting Barrel is a time and cost cutter on many operations. It is ideal for mixing, tumbling, pulverizing, etc., and is particularly efficient and suited to wet grinding (or sand rolling) because the speed and direction of action insures a quick and thorough job at lowest cost.

This new Hartford Barrel is available for both belt and built-in motor drives.

It will pay you to look into the possibilities offered through the use of the Hartford Triple-Action Cutting Barrel and its advantages over your present hand method. Send for Illustrated Bulletin, giving full details.



Production stepped up more than 30 times!

In one plant, a Hartford Barrel is finishing 3000 small castings in the same time it formerly took to finish 90 pieces by hand. Think what such a saving would mean to you!

THE HARTFORD STEEL BALL CO.
HARTFORD CONN.

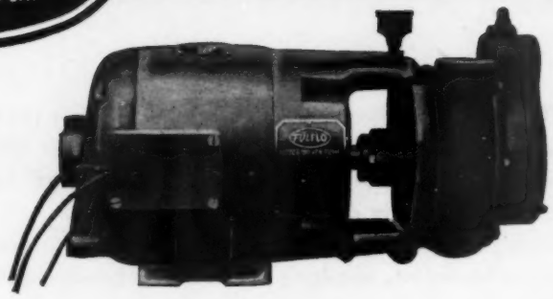
CENTRIFUGAL "FULFLO" COOLANT PUMPS

TRADE MARK "FULFLO" REG. U.S. PAT. OFF.

FULFLO COOLANT PUMP

Improved Construction Defies Grit and Chips

Here, at last, is a coolant pump which meets *all* requirements of the machine tool industry at low first cost—with still lower operating and maintenance costs. Quiet, dependable, efficient performance is assured by the following improved features.



• SPECIFICATIONS •

Centrifugal Pumping Action assures constant flow of cooling solution at all times—regardless of grit and chips.

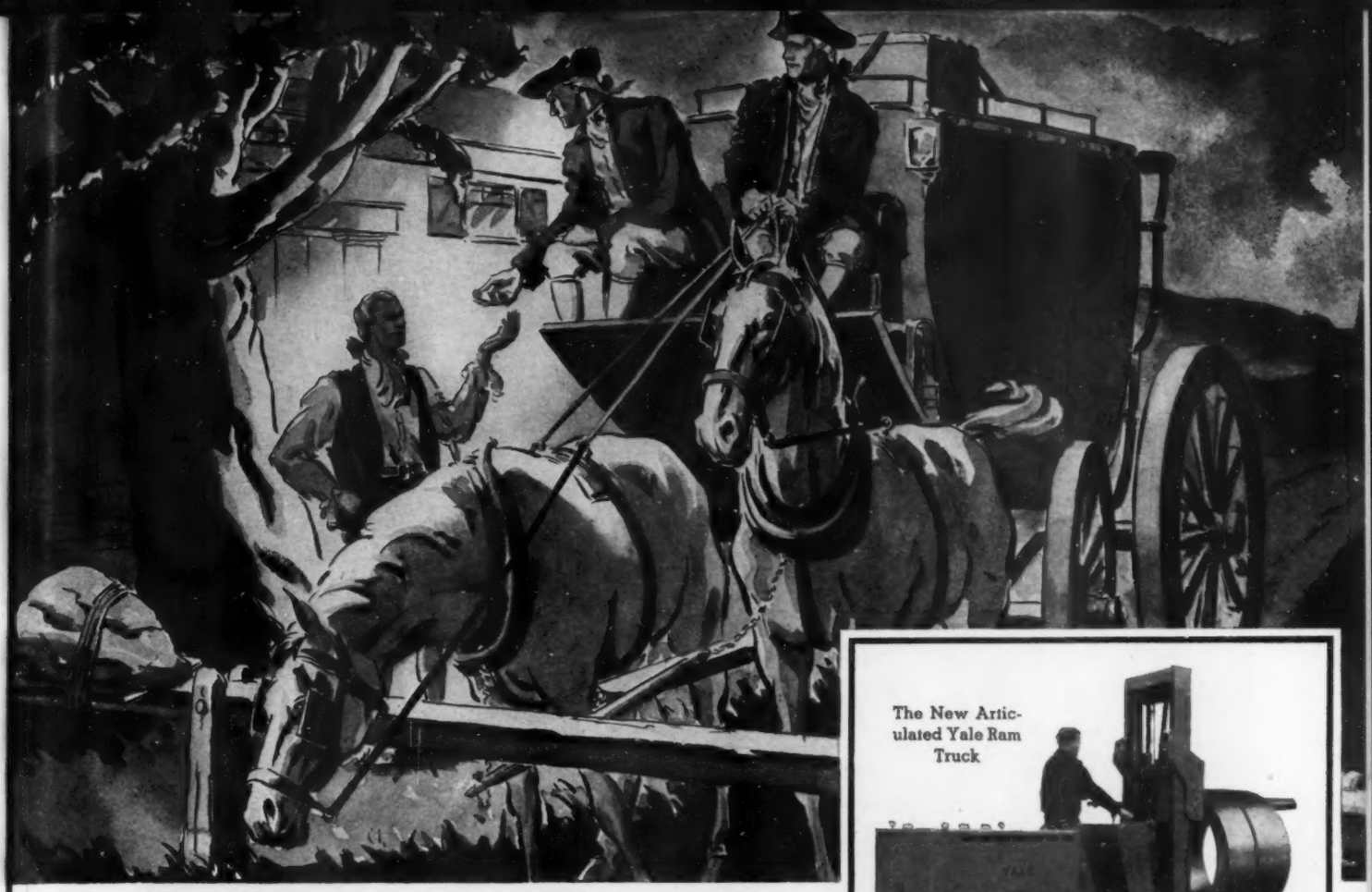
No bearing in pump to wear out. Hollow steel pump shaft slips over motor shaft—inexpensive and easily replaceable.

Spring-tension Packing eliminates adjustments and prevents leakage.

Capacity ranges from 10 to 70 gallons per minute with 10 ft. head, depending on size of motor which may be ¼, 1/3, ½ or ¾ h.p., operating at 1725 r.p.m. on any standard voltage or current.

Pump has iron body, bronze impeller, and can be mounted in any position. Choice of either straight or priming cover.

FULFLO SPECIALTIES CO. Inc., BLANCHESTER, OHIO



BEWARE THE *Toll of Tradition*

..GO MODERN WITH YALE ELECTRIC TRUCKS

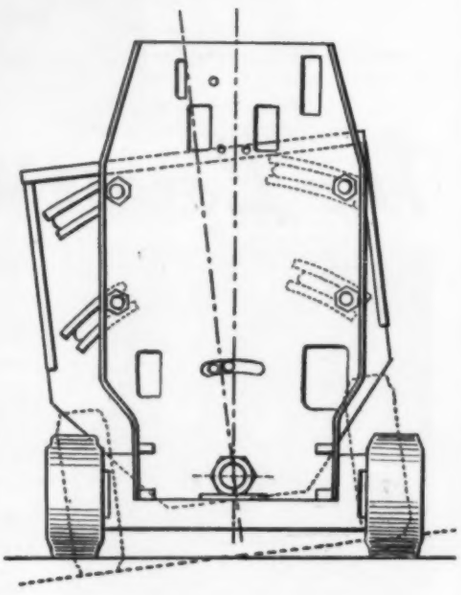
It's not so long ago that lumbering stagecoaches clattered over the highways, paying tribute at every toll gate. The most efficient mode of travel then known—*NOW* relics of a picturesque past... Because time works changes that make the efficiency of yesterday ineffectual today.

That's the price of progress—the reason that materials handling methods which may have brought results for years, fall down when compared to modern systems. One simply has to keep up with the times or pay the Toll of Tradition—excess overhead that bites deeply into profits.

Perhaps therein lies the answer to YOUR cost problem. If so, you can solve it with Yale.

YALE ELECTRIC INDUSTRIAL TRUCKS are the most modern handling equipment in their field. They combine the four features of Safety—Speed—Efficiency and Economy to the Nth degree . . . Bring you the mechanical features of tomorrow—TODAY.

The New Articulated Yale Ram Truck



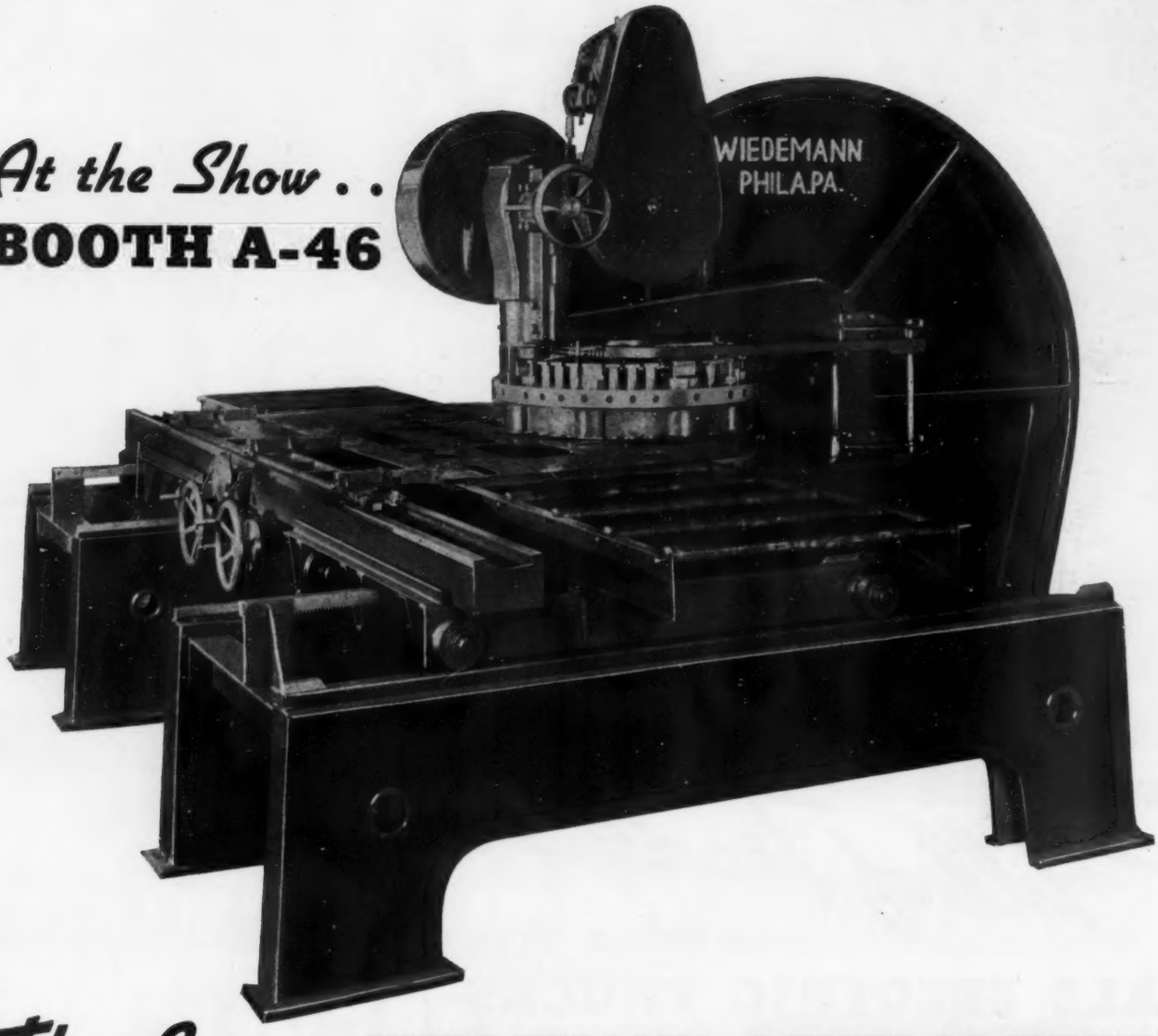
Diagrammatic view illustrating the "Caterpillar Action" of the New Articulated Yale Ram Truck. *THIS FEATURE IS EXCLUSIVE WITH YALE.*

LET OUR REPRESENTATIVE TELL YOU MORE ABOUT THE YALE LINE

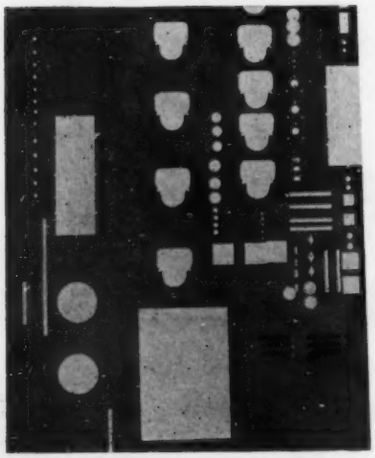
TRADE YALE MARK

THE YALE & TOWNE MANUFACTURING COMPANY,
PHILADELPHIA DIVISION, PHILADELPHIA, PA.
IN CANADA: ST. CATHARINES, ONT.

At the Show . .
BOOTH A-46



The Latest WIEDEMANN DEVELOPMENT



This sample sheet shows the wide range and versatility of punches possible with Wiedemann Machines. The Louvres shown are punched in one stroke of press. Not illustrated are knock-out punches which can be furnished for single or multiple sizes at one operation.

Three Machines Furnished to One Company This Year

In Type R7 we offer not only the largest Turret Punch ever built, but an *entirely new method* of performing punching operations. With this machine, its Roller Spacing Table, its Scales and Chart-holder, punching becomes a "production job." No layouts are necessary, handling is eliminated, output greatly increased and a reduction in costs is shown that soon pays for the machines.

Type R 7Turret Punch has a 54" depth of throat with 24 to 32 "stations" on 40" centers depending on the shapes and sizes required. It exerts a pressure of 160,000 lbs. to punch a 6" round or square hole in ¼" mild steel. The spacing table will accurately space holes in any location on sheets 50" by 100" without reversing sheet.

Further data and complete specifications of Type R7 and other Wiedemann Turret Punches on request.

WIEDEMANN MACHINE COMPANY

1815 Sedgley Avenue, Philadelphia, Pa.

PRESENTING THE NEW ALL-PURPOSE

TYPE "K"

RADIAC

REG. U. S. PAT. OFF.

CUT-OFF MACHINE

HERE'S the machine that a hundred-and-one businesses can use to their advantage. It cuts literally anything—from a paper tube to a 3 inch bar of tungsten steel! For the first time you can secure in one machine the merits of both

WET AND DRY CUTTING

Through the use of a Two-Speed, Constant H.P. Motor the change-over from wet to dry cutting is but a matter of seconds—simply insert spark pan and turn control lever to high speed. *Two machines in one.*

Like all Radiac Cut-off Machines, Type "K" is simple, sturdy and compact in design—there are no attachments or gadgets to cause trouble in the shop. It is heavy and rigid yet machined and balanced for precision work, which means too, that it is easy on both operator and wheels.

If cutting-off operations are performed in your plant it is only a matter of good business to get full particulars on this versatile new machine. The coupon below is for your convenience and involves no obligation.

SPECIFICATIONS

Motor—7½ H.P.—splash-proof, ball bearing. Two speed magnetic switch and control station. *Drive*—7 V-belts. Spindle speed optional. *Coolant System* incorporated in base. 14 gal. tank, ¼ H.P. motor, Centrifugal pump, piping and control valve. *Work clamp*, either straight or swivel, hand-operated, spring tension. Twelve Radiac cut-off discs and necessary tools. Spark guard and removable water pan.

SEE OUR EXHIBIT — BOOTH H15, NATIONAL METALS SHOW, ATLANTIC CITY — OCT. 18 TO 22

A. P. DE SANNO & SON, INC.

1615-1623 McKEAN ST., PHILADELPHIA, PA.

RADIAC TYPE 'F'

Every inch a Radiac Cut-off Machine, but small enough to be mounted on a movable bench easily taken to any location in your production set-up. Cuts solid stock up to ¾" diameter; tubing up to 1¼" diameter. Uses 10" discs operating at 5500 R.P.M. and which, when worn to about 7" can be stepped up to 6500 R.P.M. by a quick change of the V-belts. Type 'F' is *the* machine where cutting off is not a "major operation."

A. P. DE SANNO & SON, INC.
1615-1623 McKEAN ST., PHILADELPHIA, PA.

Kindly send complete data on the Radiac Machine checked below to:

☐ New All-Purpose RADIAC Cut-Off Machine ☐ RADIAC Type "F"

Name .....

Address .....

City ..... State .....

Light that reduces spoilage...

The 400-Watt Mercury Lamp is 60 to 140% more efficient than other available light sources. It burns vertically only.

By combining Mercury and Incandescent Lamps in many conventional type luminaires, a psychologically cool, white light can be obtained.

The high levels of illumination that are being obtained with General Electric Mercury Lamps make it easier for workers to see without effort. Wasted time is minimized, for eye-strain and its resultant fatigue are greatly reduced. Production is speeded up and spoilage is held down materially. Economy, too, is promoted—for General Electric Mercury Lamps provide more light per watt than other comparable light sources.

The Type-H General Electric Mercury Lamps are adapted for use on either 115- or 230-volt lines and have a rated life of 2,000 hours. Combined with incandescent lamps, these mercury lamps produce an illumination which simulates and blends well with daylight. Full details may be obtained from either address.

Order your auxiliary devices which were designed especially for this lamp from the General Electric Vapor Lamp Co.

GENERAL ELECTRIC

General Electric Vapor Lamp Co. 795H Incandescent Lamp Department
831 Adams Street, Hoboken, N. J. Dept. 165, Nela Park, Cleveland, Ohio

CONTRACT WORK

TOOLS • DIES • JIGS • FIXTURES • MOLDS • STAMPINGS • FORGINGS • SPECIAL MACHINERY • DEVICES • PARTS • SCREW MACHINE PRODUCTS • CASTINGS

Machines and Parts on Contract
Tools, Dies, Etc., to Order

Our wide range of complete modern equipment enables us to give speedy delivery on all types of special machinery and parts production at moderate costs. Send samples or blue prints for price and delivery estimates.

LINCOLN MACHINE COMPANY

Pawtucket, R. I.

COMMERCIAL HEAT TREATING
Carburizing, Hardening, Tempering and Coloring in quantity
AMERICAN METAL TREATMENT CO
Elizabeth, N. J.

We'll save you money on Swaged or Hammered Parts

With the most modern swaging and hammering equipment in our shop, we can save you time and money on all kinds of swaged and hammered parts.

Let us estimate on your requirements—We can handle stainless steel, brass, aluminum, all kinds of alloys, etc. to your specifications and order—to limits as close as .0005—to diameters from .006 in. to 3 inches.

Let us estimate also on your Screw Machine Work, Metal Stamping, and Pin and Needle Grinding, exactly to your specifications.

Send us samples or blueprints. You'll be interested in the quality of work we can do and the LOW PRICE.

PHONOGRAPH NEEDLE MFG. COMPANY, Inc.
42-46 Dudley St. Providence, R. I.

ADVERTISING RATES

CONTRACT WORK

•

DISPLAYED—RATE PER INCH:

1 inch	$6.25
2 to 3 inches	6.00 an inch
4 to 7 inches	5.75 an inch
8 to 14 inches	5.50 an inch

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page. *Contract rates on request.*

"We wanted quick action" —we got it!

¶ We wanted to place an important contract in a hurry.

¶ We wanted a firm who could tool up quickly and then could follow through consistently.

¶ We wrote to advertisers in the Contract work section of American Machinist.

¶ We made connections without difficulty and we got quick action!

—and that's the way progressive firms will get together in 1937—through registering contract shop or surplus facilities on this page, or consulting it when they are needed. Should YOU have an advertisement here?

SEARCHLIGHT SECTION

EMPLOYMENT : BUSINESS : OPPORTUNITIES : EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

10 cents a word, minimum charge $2.00.

Positions Wanted (full or part-time salaried employment only) ½ the above rates, payable in advance.

(See ¶ on Box Numbers.)

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads. Replies forwarded without extra charge.

Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 inch $6.25
2 to 3 inches..... 6.00 an inch
4 to 7 inches..... 5.75 an inch
8 to 14 inches..... 5.50 an inch

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page. *Contract rates on request.* A.M.

Copy for new advertisements must be received by Monday 10 a.m. to appear in the issue out Wednesday of the following week

POSITIONS VACANT

CONTACT MAN covering Connecticut or New England to obtain orders for special machinery and machine parts; prefer man with established clientele. P-290, American Machinist, 330 West 42nd Street, New York City.

PROGRESSIVE MANUFACTURER in Middle West requires services of graduate engineer. Experience in machine design essential. Knowidge of hydraulics advantageous—but not essential. Give full particulars as to qualifications, salary expected, etc. in first letter. P-291, American Machinist, 520 No. Michigan Ave., Chicago, Ill.

EMPLOYMENT SERVICE

SALARIED POSITIONS, $2,500 to $25,000. This thoroughly organized advertising service of 27 years' recognized standing and reputation carries on preliminary negotiations for positions of the caliber indicated through a procedure individualized to each client's personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by a refund provision as stipulated in our agreements. Identity is covered and, if employed, present position protected. If you have actually earned over $2,500, send only name and address for details. R. W. Bixby, Inc., 266 Delward Bldg., Buffalo, N. Y. (A.M.)

POSITIONS WANTED

New York

SUPERVISOR, varied experience tool and die-maker, can show results handling help. PW-280, American Machinist, 330 West 42nd Street, New York City.

TOOL DESIGNER and production man available, 35 years old. Extensive experience in the manufacture of small and medium-sized equipment, instruments, and accessories, series and mass production. Practical man with thorough technical education. PW-292, American Machinist, 330 West 42nd Street, New York City.

Pennsylvania

FIRST CLASS TOOL and Die Maker. 22 years' experience on precision work. 8 years in supervisory capacity. Wishes connection with a progressive concern. PW-283, American Machinist, 330 West 42nd St., New York City.

PATENT ATTORNEY

PATENTS—Booklet free. Highest references. Best results. Watson E. Coleman, Patent Lawyer, 724 Ninth Street, Washington, D. C.

SELLING OPPORTUNITIES

OFFERED—WANTED

Selling Agencies—Sales Executives
Salesmen—Additional Lines

OPPORTUNITY WANTED

DAILY REPORT on new business available in 48 states. Construction projects, industrial and commercial building, public works, all types of civil engineering construction reported in proposed, bids asked, and contracts awarded stages. Mailed daily for first class or air mail, $10 per month, $1 additional for air mail. Speeds up sales follow up. Write for sample. McGRAW-HILL CONSTRUCTION DAILY, 300 W. 42nd St., New York, N. Y.

FREE BULLETIN

Stock list No. 737, 24 pages, 8½x10¾, classified and illustrated saddle stitched. Write to The O'Brien Machinery Co., 113 N. 3rd Street, Phila., Pa.

(POSITIONS VACANT)

MECHANICAL DESIGNERS

A Chicago company will employ technical college graduates familiar with power plant design. Must have knowledge of machine shop practice. Salary will be entirely commensurate with ability. Permanent positions to qualified men. Give past experience and references.

P-288, American Machinist,
520 No. Michigan Ave., Chicago, Ill.

FOREMAN

For machine assembly. State fully previous experience. Give references, age, nationality, religion and salary expected.

P-287, American Machinist
330 W. 42nd St., New York City

WANTED

SUPERINTENDENT

of production for machine shop in Southern N. H. Write giving age, record and salary expected.

P-279 American Machinist
330 W. 42 St., New York City

EMPLOYERS - EMPLOYEES

THE TECHNICAL SERVICE COMMITTEE

Engineers Club, 1317 Spruce St., Philadelphia, Pa. sponsored by engineering and chemical societies, operating a professional employment service, solicits calls for men and positions.

SALES?

A TOTAL OF 16 YEARS' experience with a well-known machine tool builder—ranging from starting at scratch with a new product up to 6 years as Sales Manager—has equipped me to do a first class job for some other manufacturer. No, not old—just started the period when "life begins." Responses in confidence. PW-293, American Machinist, 330 W. 42nd St., New York City.

WANTED

Wire feed screw machines and millers (motor driven). Old established firm of English machine tool merchants wish to receive quotations from actual manufacturers with view to purchase for cash.

PIDGEN BROS. LTD.
Helmet Row London, England

MACHINE SHOP

consisting of **land, building, machinery** and **equipment** for **sale as a going concern.** May be inspected during business hours.

STEINMETZ MACHINE SHOP
55 Henry St., East Port Chester, Conn.

SQUARING SHEARS

16 foot **TOLEDO** ¼" cap. 15" Gap. Belted Motor Dr. $500‡ H—Serial ‡4449. Perfect mechanical condition.

FALK MILL SUPPLY CO., INC.
18 Ward St., Rochester, N. Y.

HONING MACHINE

Brand new Hutto Vertical Heavy Duty Hydraulic, Model 1-VH-1024, having a capacity up to 10" in diameter by 24" stroke length. Complete in every respect including electrical equipment.

THE FAST BEARING COMPANY
Hampden Avenue and 23rd Street, Baltimore, Md.

GAGE BLOCKS

Closing out $150.00 sets for $63.00. Get a complete 33 block set of rectangular shape gage blocks giving over 50,000 combinations in tenthousandths. Accuracy .00001". Blanks aged for 12 years. Gages brand new.

A rare opportunity. Write today.

THE VAN KEUREN CO.
Watertown, Mass.

FOR SALE

GRINDERS

Heald 65 cylinder grinder, motor mounted. 8"x18" modern plain grinder motor mounted, both in first class condition, complete with tools, grinding wheels, Etc. $1650.

CLERGY MACHINE CO.
Des Moines Iowa

2-40"x18' Pond Geared Head **Lathes**
1-14"x96" Landis Cylindrical Grinder

GANEY MACHINERY CO.
125 Arthur St. Buffalo, N. Y.

BARGAINS IN PULLEYS

250 Pulleys 6" to 128" diameter, various faces and bores; steel split, C. I. split, C. I. solid, for sale singly at one-half new list price or will accept offers for entire lot. Located Hartshorne, Oklahoma.

Write P. O. Box 3046, Houston, Texas

Notice to Advertisers

Because of the Holiday, Columbus Day, October 12th, "Searchlight" pages of the October 20th issue of

AMERICAN MACHINIST

close for the press earlier than the usual closing time.

The cooperation of advertisers is solicited in forwarding new copy, or changes of copy, to reach us accordingly.

FINAL CLOSING TIME
DISPLAY AND UNDISPLAYED ADS:
MONDAY 10 A.M.
OCTOBER 11th

LUCAS LIST

MACHINERY REBUILDERS

FOR OVER 30 YEARS

SPECIALS

8½' American Triple Purpose Radial Drill
2—5' American Radial Drills
3—10"x18" Norton Plain Grinders M.D.
2—14"x36"—42" Model 81 Type B Norton Crank Pin Grinder
#72 Heald Internal Grinder, 3 motor drive
#72A5 Heald Sizematic Grinder
2—#1 Brown & Sharpe Universal Grinder, motor drive
#3 Brown & Sharpe Universal Grinder
2—14"x6' Hendey Yoke Head Lathes
#2 Cincinnati H.P. Plain Miller, S.P.D.
#30 Sundstrand Rigid Mill
New #3 & #4 Manville Pillar Presses

Send for the latest Lucas List

J. L. LUCAS & SON, Inc.
3 Fox St., Bridgeport, Conn.

No. 30 & 63 Bliss Punch Presses
No. 4½ Waterbury Farrell Punch Press
16" and 24" Gould & Eberhardt Shapers Motor Driven Thru Gear Box
24" and 28" Gould & Eberhardt Shapers Cone Drive
No. 24 Gardner Horiz. Disc Grinder—53"
No. 2 Kempsmith Universal Miller
No. 2 & 3 Cincinnati Plain Millers—Cone Drive
Avey Ball Bearing Drills 2 & 3 spdle. No. 2 Taper

Indianapolis Machinery & Supply Co. Inc.
1959-69 South Meridian Street
Indianapolis, Indiana

MILLING MACHINES

Plain, Universal & Manufacturing

1—#1 Knight Drilling & Milling Machine, m.d.
1—#3 Kempsmith Plain Maxi-Miller, m.d.
2—#3 Cincinnati Slotted Nose Plain Millers, rapid traverse
1—#4 Cincinnati Plain Miller, rapid traverse, m.d.
1—#5 Cincinnati Plain rd. Overarm, rapid traverse, m.d.
1—#5 Cincinnati Rect. Overarm, rapid traverse, m.d.
1—#3-A Heavy Brown & Sharpe Universal Miller, sgle. pulley dr.
1—#3B Kempsmith Plain Mfg. Miller
2—#4 48" Cincinnati-Duplex Auto. m.d.
3—#12 Brown & Sharpe Mfg. cone dr.

We Carry a Full Stock of Used Machine Tools
Your Inquiries will be appreciated

THE STRONG, CARLISLE & HAMMOND CO.
1392 West Third St., Cleveland, Ohio
2832 East Grand Blvd., Detroit, Michigan

UNUSUAL VALUES

MACHINERY

1—Back Geared Ceiling Suspended Drill.
1—Four Spindle Foote-Burt #24 High Duty Drill.
1—Baush 5' Radial Drill.
1—20" Hoefer Sliding Head Drill.
1—20" Plain Upright Drill.
1—Baush Multiple Head Drill.
4—Lo-Swing Lathes.
5—Bryant Grinders.

MOTORS

New 5 H.P., 1800 RPM., 3-60-220 v. Motors, $61.75

Other New Motors at Equally Low Prices
Good, Used and Rebuilt Motors

The Osborne & Sexton Machinery Co.
COLUMBUS, OHIO

GRINDERS

INTERNAL

No. 72A5 Heald Plain Internal, 2 motor drive, hydraulic feed, latest
No. 11 Giddings & Lewis Teromatic, 3 motor drive, hydraulic feed
No. 1 Landis Internal, belt
No. 3 Bryant Semi-Automatic Hole Grinder, m.d.
No. 70 Heald Internal, belt
No. 3, 103 Rivett Internal, belt
No. 15A Bryant Plain Semi-Automatic 2 spindle Hole & Face Grinder, m.d.
No. 15A Bryant, belt

SURFACE

No. 3 Brown & Sharpe, Planer Type Surface, belt
No. 2 Brown & Sharpe, Automatic Surface, belt
No. 3 Wilmarth & Morman Auto. Surface, belt
No. 33 Abrasive Vertical Surface, m.d. in base
No. 78 Wilmarth & Morman Auto. Surface, m.d.
12" Pratt & Whitney Vertical Surface, belt
18x84" Diamond Light Duty Face, m.d.
60" Bridgeport Face, m.d.

TOOL & CUTTER

No. 1 LeBlond, plain equipment
No. 1 LeBlond Universal, universal equipment
No. 1½ Cincinnati Universal, plain equipment
No. 2 Oesterlein, universal equipment
No. 2 Norton, plain equipment
No. 1 Norton, universal equipment
No. 21, 31, 41 Oliver Drill, m.d. in base
Sellers Drill Grinder, m.d.
Gleason Cutter Grinder, belt

UNIVERSAL

No. 3 Brown & Sharpe, belt
No. 4 Landis, belt

DISC

No. 4 Gardner B.B., s.p.d.
No. 6 Diamond, belt
No. 12, 120 Gardner, center type
No. 14 Gardner, belt
No. 24—53" Gardner Horizontal, m.d., 58" disc

CYLINDRICAL

6x18", 10x24", 10x36", 10x52", 10x72", 12x52", 12x72", 16x52", 16x72", 20x144" Landis Plain Self-Contained, m.d.
No. 11—6x32" Brown & Sharpe
No. 14—10x18" Brown & Sharpe
6x32", 10x36", 10x50", 10x72", 12x72", 16x36" Norton Plain Cylindrical, belt
10x72" Norton, 2 motor drive
12x36" Cincinnati
8x30" Modern, m.d.

MILLING MACHINES

No. 2, 2 Cincinnati Plain, s.p.d., flanged spindle
No. 1, 2 Cleveland Plain, s.p.d.
No. 2H Brown & Sharpe Plain, cone
No. 2H LeBlond, cone
No. 2 Kempsmith Plain, cone
No. 3, 4 Cincinnati Plain, cone
No. 2 Hendey-Norton Plain, cone
No. 2 Brown & Sharpe Universal, cone
No. 6 Becker Vertical, cone
Ingersoll Vertical, m.d., 40" rotary table
48" Cincinnati Worm Driven Plain Automatic, s.p.d.
48" Cincinnati Spur Driven Plain Automatic, s.p.d.
24" Cincinnati Plain Automatic, m.d., National Standard Spindle
24" Cincinnati Duplex Automatic, m.d.
24" Cincinnati Duplex Automatic, belt
No. 33 Kempsmith Mfg., s.p.d.
48" Oesterlein Tilted Offset, m.d., Timken Bearings, National Standard Spindle
C66A Newton 3 spindle Continuous Miller, 48" dia. table
36"x42"x10' Ingersoll Planer Type Milling Machine, m.d.
48"x42"x8' Ingersoll Planer Type Slab Miller, m.d.
6x30" Pratt & Whitney Thread Miller, m.d.
No. 1 Standard Hand, belt
No. 3 Fox Hand, belt
No. 2 Pratt & Whitney Hand, belt
No. 6 Whitney Hand, belt

More than 1500 Machines in Stock

SEND US YOUR INQUIRIES

The EASTERN MACHINERY CO.
1004 Tennessee Ave., Cincinnati, Ohio

IMMEDIATE DELIVERY

Automatics
No. 2G Brown & Sharpe
3¼", 4¼" Gridley, Sgle. Spdl.
4¼" Cleveland "Model A"

Boring Machines, 5" Bar N-B-P Floor Type
5" Bar Newton Portable
No. 3 Hamilton, 4½" bar
No. 36 Rochester, 3¼" bar
No. 2 Rochester, 3" bar
No. 3A Universal, 3" bar
No. 1 Cleveland, 2½" bar

Boring Mills, 24", 36", 42" Bullard "New Era"
30" King
42", 48" & 54" Colburn
52" & 62" King
60" Colburn, M.D.

Drills—1, 2, 3, 4, 6 spdl. Leland-Gifford
1, 2, 3, 4, 6 spdl. Henry & Wright
No. 2 Colburn 1, 2, 3 & 4 spdl.
No. 3—24" Defiance
Nos. 121, 314, 513 Baker
No. 210—1 and 3 spdl. Barnes
No. 14 Natco Multiple
No. 4 Bausch Multiple

Radials—
4' American plain
4' Cinn.-Bickford plain
5' American Full Univ. M.D.
6' American Triple Purpose
6' Cinn.-Bickford Univ.

Gear Cutters, No. 18-H Gould & Eberhardt
No. 16—9IS Gould & Eberhardt
No. 3—26" Brown & Sharpe
No. 4—48" Brown & Sharpe
No. 6—60" Brown & Sharpe
No. 6—72" Brown & Sharpe
.6" Newton Heavy Duty
Nos. 6, 61, 62, 65, 615, 625 Fellows
12"x72" G.&E. Rack Cutter

Grinders, 10"x36", 52" Landis, plain
20"x168" Landis, plain, M.D.
No. 13 B. & S. Univ. Cutter & Tool
No. 2 B. & S. Universal
No. 4—12"x56" Landis Universal
No. 70 Heald, Internal
No. 1½ Landis, Internal
No. 10 Blanchard Surface
No. 16-A Blanchard Auto. Surface
15"x17"x6', 8' Norton O.S. surf., mag. chuck
No. 1 Gardner face, Hyd. Fd.
16"x48" Landis Crank Shaft

Motor Drive Norton Grinders

6"x32"	10"x96"
10"x18"	14"x36"
10"x24"	14"x50"
10"x36"	14"x72"
10"x50"	16"x50"
10"x72"	18"x96"
18"x144"	

Lathes—
14"x6' American, grd. bd., T.A.
14"x6' Lodge & Shipley
16"x6' American
16"x8' Lodge & Shipley, taper attach.
18"x8' Lodge & Shipley
18"x10' Reed-Prentice grd. bd.
20"x14' L. & S. sel. grd. bd.
24"x12', 14' L. & S. Sel. Grd. Bd.
30"x11', 20' American Grd. Bd.
36"x18' Lodge & Shipley, patent head
36"x30' Rahn-Larmon, grd. bd.
54"x23' Johnson, T.G.
66"x21' Putnam, triple geared

Millers, No. 2-B Brown & Sharpe, plain
No. 2, No. 3 Cincinnati, high power, plain
No. 2-B, No. 3-B Milwaukee, Plain
No. 3-B, No. 4-B Heavy Brown & Sharpe, pl.
No. 4 Cincinnati, plain
Nos. 1½, 2 B. & S. Universal
No. 4 Cincinnati high power, Universal
No. 2, No. 3, Cincinnati H.P. Vertical
No. 3-B, No. 4 Milwaukee Vertical
No. 5-B, No. 6 Becker Vertical
No. 4 & No. 8 Lees-Bradner Thread
Hanson-Whitney Thread Miller
18" & 24" Cincinnati Auto. Duplex
No. 5—48" Cincinnati Pl. Hydromatic
36"x36"x12' Newton Duplex Miller
36"x44"x20' Ingersoll Slab Miller
48"x36"x16' Ingersoll Adj. Rail

Planers, 24"x24"x6' American
20" Lynd-Farquhar OS., planer, shaper
30"x30"x6' & 18' Cincinnati
36"x36"x8', 12', 18' Cincinnati
36"x36"x14'—24' Cleveland Open Side
36"x36"x24' Gray
42"x42"x30' Niles Bement Pond, rev. m.d.
48"x48"x14' Liberty Open Side
60"x48 x16' Gray, arr, rev. M.D.
60"x48"x20' Hamilton
72"x60"x16' American

Shapers, 16" Walcott
16" Stockbridge
20" & 24" Gould & Eberhardt
32" Ohio Dreadnaught

Turret Lathes, No. 4 W. & S. Universal
No. 1-A Warner & Swasey
No. 3-A W. & S., Timken Brg.
No. 3 Cin.-Acme, A.C. & B.F.
No. 4-A W. & S., 7¼" H.S.
No. 4-L Gisholt 9¼" H.S.

HILL-CLARKE MACHINERY CO.
651 Washington Blvd. - Chicago

SOME OF OUR LARGE MACHINES FROM STOCK

109" x 50' Niles B. P. Heavy duty lathe
96" x 54' Niles B. P. Lathe
90" Niles B. P. wheel lathe
84" x 29' Niles B. P. extra heavy duty lathe
42" x 22" Niles B. P. extra heavy duty geared head
48" Niles B. P. Wheel lathe
36" x 26' Lodge & Shipley geared head
30" x 16' Houston Stanwood and Gamble heavy duty lathe
#30-M Giddings and Lewis horizontal Milling Machine
#10 Niles B. P. heavy duty vertical miller
#44 Rockford vertical miller
#5-C, #2A, Model SD and CS Becker vertical millers
#2 Cincinnati hi-Power vertical miller
#5 Cincinnati Hi-Power Plain miller
#4B Brown & Sharpe heavy duty miller
#4 LeBlond plain miller
Various Ingersoll planer type millers
16' Niles Vertical Boring Mill
10-16' Betts heavy duty vertical boring mill
10' Betts vertical boring mill
7'-10' Betts vertical boring mill
96" Niles Vertical Boring Mill
90" Pond vertical boring mill
60" Niles vertical heavy duty boring mill
60" Colburn vertical boring mill
36"-44" Niles vertical lathe
#45 Giddings & Lewis horizontal boring mill
6" Bar Espen-Lewis horizontal boring mill
#1, 2 and 6 Barrett horizontals
84" x 84" x 20' Niles B. P. Planer
84" x 60" x 14' Niles B. P. Planer
72" x 72" x 12' Niles B. P. Heavy Duty Planer
56" x 56" x 12' Niles B. P. Heavy Duty Planer
56" x 48" x 10' Cincinnati Heavy Duty Planer
48" x 42" x 20' Detrick and Harvey Open Side Planer
.72" Bement Rotary Planer
.100" Gould and Eberhardt horizontal Hobber
24" Gleason Planer—Bevel
1—40" x 20' Landis plain cyl. grinder
1—18" x 84" Landis plain cyl. grinder
1—14" x 72" Horton plain cyl. grinder
#2 Brown and Sharpe Universal Grinder
#13 Brown and Sharpe Universal Grinder
5'—6' Cincinnati Bickford Plain radial M. D. drill
1—5' Niles Right line plain radial drill
1—5' American triple purpose plain drill
1—40' x 1" Southwark bending rolls

SIMMONS MACHINE TOOL CORPORATION

ALBANY, NEW YORK — NEW YORK CITY—149 BROADWAY

WRITE FOR LATEST STOCK LIST

HIGH GRADE MACHINE TOOLS

LATHES
18"x17' Lehman Grd. Hd.
21"x10' LeBlond Grd. Hd.
19"x8' LeBlond
24"x12' L&S 3 SCD
27"x16' L&S Grd. Hd.
36"x20' L&S Sel. Grd. Hd.
42"x18' Bridgeford Grd. Hd.
42"x20' American Grd. Hd. A.C. M.D.

GRINDERS
16"x72" Landis Plain, Self Cont.
10"x36" Landis
Nos. 50, 55, 60, 65 and 70 Healds

GEAR CUTTERS
3—26", 3—36" B&S
#6 Fellows
16H Gould & Eberhardt Hobber
0" Gleason

BOLT AND PIPE THREADERS
½" Landis Dbl. Spdl., Lanco Hds. M.D. Lead Screws
2½" Landis Lead Screw
2" Acme S.P.D.

BORING MILLS
24" Bullard "New Era" A.C. mot. dr.
42" Colburn
No. 2 Barrett Horz. No. 1 Rockford Horz.

MILLING MACHINES
3H LeBlond Plain, 3 S.C.D.
No. 4 B&S Univ., S.P.D.
No. 2 Cleveland SPD
No. 3 Cincinnati Univ. H.P. Cone drive
No. 4 Cincinnati Plain High Power, Cone
No. 4 Cincinnati Miller, Universal Cone Drive
No. 2 and 3 Kempsmith Plain, Cone
No. 3 Kempsmith Universal, Cone
24" Cincinnati Automatic Duplex Miller

PLANERS
24"x24"x8' Gray
26"x26"x8' Cleveland

RADIAL AND UPRIGHT DRILLS
2½, 3, 3½, 6' Cinc.-Bick., S.P.D.
3, 3½, 4 and 6' American Triple Purp. Enc. Hd.
20" 3 spdl. Barnes camelback

SHAPERS
16", 20", 24", G.&E., mtr. dr., thru. g.b.

Write for Complete Catalog. We Buy, Sell and Exchange

CINCINNATI MACHINERY & SUPPLY CO.
217 East Second St. Cincinnati, Ohio

BORING MILL, 42" Bullard, 2-hds, PRT., M.D.
DRILL, Radial, 4' Dreses G.B., M.D.
GRINDER, Surface #5 Abrasive, 14x48", M.D.
GRINDER, Roll, 16"x62" & 20"x96", both M.D.
KEYSEATERS, #2 & #3 M. & M., belted.
LATHE, 20"x8' Hendey, Geared Head, TA., M.D.
LATHE, Turret #4 W&S, cone or V.S. M.D.
MILLER, #4 Ohio "Special", range 72x30x20", M.D.
NUT RUNNER, #4-B&D., portable, ⅞" AC or DC.
SHAPER, 16" G&E., 3 HP. Gen. Elec. Motor 3/60/220.
SHAPER, 24" G&E., var. speed 220 V. DC. motor.
TESTING MACHINE, 100-ton Olsen Compression.

Marr-Galbreath Machinery Co.
55 Water St., Pittsburgh, Pa.

No. 3B, D.A. Milwaukee Universal Miller —Vert. attach.—S.P.D.
4½' Morris Radial S.P.D. gear box
12x72 Landis Plain Grinder.
27"x10' American GH Lathe M.D.
3' Morris Radial S.P.D. gear box
20" Stockbridge Shaper Cone Drive.
15" P. & J. Cone Drive Universal Table.
No. 3 Mitts & Merrill Keyseater.
30 Ton Lucas Power Forcing Press.
6' and 10' Robinson Press Brake.
Crankshaft Grinders Landis 12" and 16".
No. 2 B. & S. Surface Grinder with magnetic chuck.
6—#19 Bliss Inc. presses.

IROQUOIS MACHINERY CO.
662 Ohio St. Buffalo, N. Y.

ST. LOUIS BARGAINS

BORING MILLS—Barrett 5" Bar Horiz.
BORING MILLS—Baush 44" M.D. Vert. & Others.
DRILLS—Allen 6-SP. H&W 5-Sp. H.S. B.B.
DRILLS—Barnes 24" All Geared Camel Back.
DRILLS RADIAL—2½', 3' & 4' S.P. Gear Box
GRINDER—Brown & Sharpe 10x72" Plain & 10"x48".
GRINDER—P&W 12" Vert. Surf.
GEAR CUTTERS—G&E 36" S.P.D. G&E 60" M.D.
HONEING MACH.—Hutto 2-SP. M.D. Vert.
LATHES—Reed Prentice 16"x8 M.D. Geared Head
LATHES—L&S. B&E 20"x10' Q.C.G. D.B.G.
MILLING MACHINE PLAIN—Milwaukee #3-B S.P.D. CINCINNATI #3 S.P.D. Hvy. Duty.
MILLING MACH. UNIV.—B&S #3. & Kemp. #3.
SHAPERS—G. & E. 16" & 20" Cin. 24" M.D. Ohio 36". Nearly new Ohio 20" and Smith & Mills 16" & 24". Rock. 24" M.D. Gear Box.
TAPPING MACHS.—Garvin #2 Vert. (3).

LARGEST STOCK IN ST. LOUIS

McDONALD MACHINERY CO.
1531-35 N. BROADWAY, ST. LOUIS, MO.

BARGAINS-TO MOVE QUICKLY

CLEVELAND Style "EF" Double Punch and Shear, 36" throat, belt driven with countershaft, equipped with architectural jaws, punching attachment and split shears, hand and foot levers, each bed having 1½ ton crane, with six foot beam with trolley. Used very little, excellent condition.

1 *Greenlee Hollow Chisel Mortiser and Borer*
1 *Oliver No. 97 Swing Cut-off Saw*
1 *Niles 8-ft. Flanging Clamp*

Address:

FS-239, American Machinist
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#3 Bryant Internal.

RADIAL DRILLS
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8' Cincinnati Bickford, Enclosed Head Lathes.
42"x27' American, 16 Speed Geared Head.

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#3-B, Milwaukee Vertical—Motor in base, Power Rapid Traverse.
#4 Cincinnati Vertical.

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8", 12", 10" Heald Rotary Surface Grinders.
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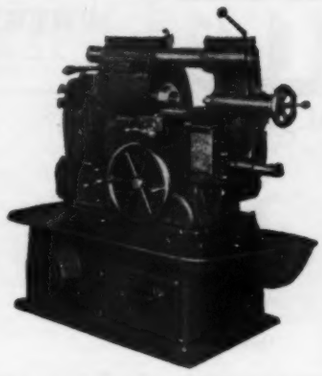

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GRINDER—#14 Brown & Sharpe External B.D.
GRINDER—#70 Heald Internal Grinder B.D.
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NEWTON No. 2 Ver. spdle. keyseat
BROWN & SHARPE No. 4 Universal cone dr.
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GLEASON 10" Spiral Bevel Gear
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FELLOWS Nos. 7, 71
FELLOWS No. 8B Burnisher
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PERSONS ARTER 12" Rotary Surf.
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HEALD No. 72 Hydr.; 72-A-3 Sizematic
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PRATT & WHITNEY No. 14 surface

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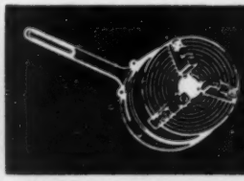
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Macklin Co., Jackson, Mich.
Norton Co., Worcester, Mass.

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Norton Co., Worcester, Mass.

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Elmes Engineering Works, Chas. F., Chicago

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Linde Air Products Co., The, N. Y. C.

ACETYLENE GAS
Air Reduction Sales Co., N. Y. C.

ADAPTORS
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Linde Air Products Co., N. Y. C.
Union Carbide & Carbon Corp., N. Y. C.

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Cincinnati Milling Mach. Co., Cincinnati
Cleveland Twist Drill Co., Cleveland
Cochrane Bly Co., Rochester N. Y.
Scully-Jones & Co., Chicago

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Morse Twist Drill & Mach. Co., New Bedford, Mass.
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.

BABBITT
Westinghouse Electric & Mfg. Co., E. Pittsburgh

BALANCING Machines
Gisholt Machine Co., Madison, Wis.

BALLS, Brass, Bronze & Steel
Atlas Ball Co, Philadelphia, Pa.
Hartford Steel Ball Co, Hartford, Conn.
Hoover Ball & Bearing Co., Ann Arbor, Mich.
New Departure Machine Co., Racine, Wis.

BALLS, Burnishing
Atlas Ball Co., Phila., Pa.
Hartford Steel Ball Co., Hartford, Conn.

BAND SAWS
Delta Mfg. Co., Milwaukee

BARRELS, Tumbling
Hartford Steel Ball Co., Hartford, Conn.

BEARINGS, Ball
Fafnir Bearing Co., New Britain, Conn.
Federal Bearings Co., Inc., Poughkeepsie, N. Y.
Hoover Ball & Bearing Co., Ann Arbor, Mich.
New Departure Mfg. Co., Bristol, Conn.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Schatz Mfg. Co., Poughkeepsie, N. Y.
S. K. F. Industries, Inc., Phila.
Torrington Co., Torrington, Conn.

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Hoover Ball & Bearing Co., Ann Arbor, Mich.
Norma-Hoffman Bearings Corp., Stamford, Conn.
S. K. F. Industries, Inc., Phila.
Timken Roller Bearing Co., Canton, Ohio

BEARINGS, Taper
Hoover Ball & Bearing Co., Ann Arbor, Mich.
Timken Roller Bearing Co., Canton, Ohio

BEARINGS, Thrust
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S. K. F. Industries, Inc., Phila.
Timken Roller Bearing Co., Canton, Ohio

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Cincinnati Shaper Co., Cincinnati, O.
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Modern Tool Wks., Rochester, N. Y.
Ryerson & Son, Inc., Jos. T., Chicago

BITS, Tool Holder
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Firth-Sterling Steel Co., McKeesport, Pa.

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General Electric Co., Schenectady, N. Y.

BLOWERS, Electric
Allis-Chalmers Mfg. Co., Milwaukee

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Foote-Burt Co., Cleveland
Haskins Co., R. G., Chicago
Landis Mach. Co., Waynesboro, Pa.
National Acme Co., Cleveland
Oster Mfg. Co., Cleveland

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Acme Mach. Company, Cleveland

BOLT Threading Machinery
Oster Mfg. Company, Cleveland

BOLTS, Eye, T-Slot, Etc.
Armstrong Bros. Tool Co., Chicago

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McGraw-Hill Book Co., Inc., N. Y. C.

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Cincinnati Planer Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Gisholt Machine Co., Madison, Wis.
Modern Tool Wks., Rochester, N. Y.
Sellers & Co., Inc., Wm. Phila.

BORING Bars and Heads
Bullard Company, Bridgeport, Conn.
Gesholt Machine Co., Madison, Wis.
Scully-Jones & Co., Chicago
Williams & Co., J. H., Buffalo, N. Y.

BORING, Drilling and Milling Machines, Horizontal
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Dreses Mfg. Co., Cincinnati
Landis Tool Company, Waynesboro, Pa.
Lucas Mach. Tool Co., Cleveland
Modern Tool Wks., Rochester, N. Y.
Niles Tool Wks. Co., Hamilton, O.
Putnam Mach. Co., Hamilton, O.
Sellers & Co., Inc., Wm., Phila.
Springfield Mach. Tool Co., Springfield, O.

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A Classified Index of Advertisers in this Issue

BORING, Drilling and Milling Machines, Vertical
Barnes & Co., W. F. & John, Rockford, Ill.
Sellers & Co., Inc., Wm., Phila.

BORING Machines, Car Wheel
Sellers & Co., Inc., Wm., Phila.

BORING Machines, Cylinder
Baker Bros., Inc., Toledo, O.

BORING Machines, Jig
Baker Brothers, Inc., Toledo, O.
Pratt & Whitney, Div. Niles Bement Bond Co., Hartford, Conn.

BORING Machines, Locomotive Drive Box
Sellers & Co., Inc., Wm., Phila.

BORING Machine, T. C. Tool
Heald Mach. Co., Worcester, Mass.

BORING Machines, Vertical
Bullard Co., Bridgeport, Conn.

BORING Tools
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Ready Tool Co., Bridgeport, Conn.
Scully-Jones & Co., Chicago
Williams & Co., J. H., Buffalo, N. Y.

BRAKES, Magnetic
Westinghouse Elec. & Mfg Co., E. Pittsburgh

BRAKES, Press
Cincinnati Shaper Co., Cincinnati, O.

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Cerro de Pasco Copper Corp., N. Y. C.

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National Broach & Mach. Co., Detroit
Oilgear Corp., Milwaukee, Wis.

BROACHING MACHINES
Cincinnati Milling Mach. Co., Cincinnati
Oilgear Corp., Milwaukee, Wis.

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Hones, Inc., Chas. A. Baldwin, N. Y.

BURRING Machines, Nut
Acme Mach. Co., Cleveland

BUSHINGS, Drill and Jig
Universal Eng. Co., Frankenmuth, Mich.

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CABLES, Electric
Lincoln Electric Co., Cleveland

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Randall & Stickney, Waltham, Mass.
Scherr Co., George, N. Y. C.
Slocomb Co., J. T., Providence, R. I.
Starrett Co., L. S., Athol, Mass.

CALIPERS, Dial
Federal Products Corp., Providence
Lufkin Rule Co., Saginaw, Mich.

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Kux-Lohner Mach. Co., Chicago

CAP Screws
Baumbach Mfg. Co., E. A., Chicago

CARBIDE
Air Reduction Sales Co., N. Y. C.
Linde Air Products Co., The, N. Y. C.
Union Carbide & Carbon Corp., N. Y. C.

CARBON, Dioxide Meters
Brown Instr. Co., Philadelphia

CARBURIZING Machines
American Gas Furnace Co., Elizabeth, N. J.

CARS, Hand
Fairbanks, Morse & Co., Chicago

CASE HARDENING AND TEMPERING COMPOUNDS
Meisel Press Mfg. Co., Boston, Mass

CASTINGS, Aluminum, Sand, Permanent Mold and Die
Aluminum Co. of America, Pittsburgh, Pa.

CASTINGS, Gray Iron
Brown & Sharpe Mfg. Co., Providence

CASTINGS, High Test and Alloy
Meehanite Institute of America, Pittsburgh

CASTINGS, Iron and Semi-Steel
Etna Mach. Co., Toledo, O.
Springfield Mach. Tool Co., Springfield, O.

CENTRIFUGAL MACHINERY
Barrett Co., Leon J. Worcester, Mass.

CENTERS, Lathe
Gesholt Machine Co., Madison, Wis.
Firth-Sterling Steel Co., McKeesport, Pa.
Ready Tool Co., Bridgeport, Conn.

CENTERING Machines
Hanson-Whitney Mach. Co, Hartford, Conn.
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.

CHAIN Drives
Link-Belt Co., Chicago
Whitney Chain & Mfg. Co., Hartford, Conn.

CHAINS, Conveyor
Link-Belt Co., Chicago
Whitney Chain & Mfg. Co., Hartford, Conn.

CHAINS, Transmission
Morse Chain Co., Ithaca, N. Y.
Link-Belt Co., Chicago
Philadelphia Gear Works, Phila.
Whitney Chain & Mfg. Co., Hartford, Conn.

CHECKS, Metal Time and Tool
Noble & Westbrook Mfg. Co., Hartford, Conn.

CHESTS, Tool
Lufkin Rule Co., Saginaw, Mich.

CHUCKING Machines
Bullard Co., Bridgeport Conn.
Gisholt Machine Co., Madison, Wis.
Goss & DeLeeuw Mach. Co., New Britain, Conn.
Jones & Lamson Mach. Co., Springfield, Vt.
Kingsbury Mach. Tool Corp., Keene, N. H.
National Acme Co., Cleveland
Potter & Johnston Mach. Co., Pawtucket, R. I.
Sunderstrand Mach. Tool Co., Rockford, Ill.
Warner & Swasey Co., Cleveland

CHUCKS
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CHUCKS, Automatic and Quick Changing
Errington Mech. Lab., Staten Island, N. Y.
Thomas Hoist Co., Chicago

CHUCKS, Collet
Sjogren Mfg. Co., Los Angeles

CHUCKS, Drill and Tap
Errington Mechanical Lab., Staten Island, N. Y.
Jacobs Mfg. Co., Hartford, Conn.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Standard Tool Co., Cleveland
Thomas Hoist Co., Chicago

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Errington Mech. Lab., Staten Island, N. Y.

CHUCKS, Lathe
Gisholt Mach. Co., Madison, Wis.
Sjogren Mfg. Co., Los Angeles
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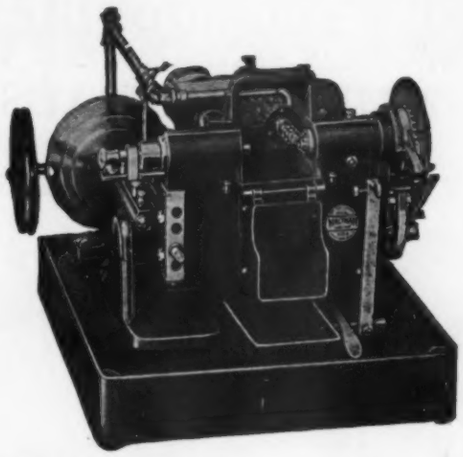

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can be used for fine pitch gears up to 1½-in. diameter. When used for pinions only, a magazine feed for the work can often be used and a considerable increase in production and reduction in labor charge obtained.

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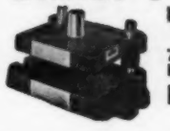

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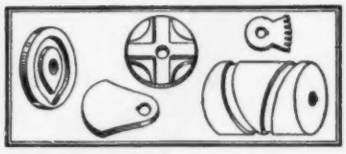

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A Classified Index of Advertisers in this Issue

CHUCKS, Magnetic
Brown & Sharpe Mfg. Co., Providence, R. I.
Heald Machine Co., Worcester, Mass.
L-W Chuck Co., Toledo
Walker Co., O. S., Worcester, Mass.

CHUCKS, Spring
Brown & Sharpe Mfg. Co., Providence, R. I.

CIRCULAR SAWS
Delta Mfg. Co., Milwaukee

CLAMPS, Machinist
Armstrong Bros. Tool Co., Chicago
Lufkin Rule Co., Saginaw, Mich.
Starrett Company, L. S., Athol, Mass.
Williams & Co., J. H., Buffalo, N. Y.

CLAMPS, Strap
Williams & Co., J. H., Buffalo, N. Y.

CLEANER'S COMPOUND
Oakite Products, Inc., N. Y. C.

CLEANERS, Metal
Bullard Co., Bridgeport, Conn.

CLUTCH Shafts, Hollow Bored
American Hollow Boring Co., Erie, Pa.

CLUTCHES
Fairbanks, Morse & Co., Chicago

CLUTCHES, Friction
Allis-Chalmers Mfg. Co., Milwaukee
Johnson Mach. Co., Carlyle, Manchester, Conn.

COIL Cradles, Automatic
U. S. Tool Co., Ampere, N. J.

COLLETS
Brown & Sharpe Mfg. Co., Providence
Union Twist Drill Co., Athol, Mass.
Whitney Chain & Mfg Co., Hartford, Conn.

COLLETS, Lathe
Gisholt Machine Co., Madison, Wis.
Rivett Lathe & Grinder, Inc., Boston

COMPARATORS, Dial
Federal Products Corp., Providence, R. I.

COMPENSATORS Motor Starting
Fairbanks, Morse & Co., Chicago

COMPOUNDS, Cutting, Drawing, Drilling, Grinding
Gulf Refining Co., Pittsburgh
Oakite Products, Inc., N. Y. C.
Sun Oil Co., Phila.

COMPOUNDS, Resin
Bakelite Corp., N. Y. C.
Formica Insulation Co., Cincinnati

COMPOUNDS, Tempering and Case Hardening
Oakite Products, Inc., N. Y. C.

COMPRESSORS, Air and Gas
Chicago Pneumatic Tool Co., N. Y. C.
Curtis Pneumatic Machy Co., St. Louis
Fairbanks, Morse & Co., Chicago
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., N. Y. C.

COMPRESSORS, Centrifugal
Allis-Chalmers Mfg. Co., Milwaukee

CONTRACT WORK
American Metal Treatment Co., Elizabeth, N. J.
Dayton-Rogers Mfg. Co., Minneapolis, Minn.
Hartford Special Machy. Co., Hartford, Conn.
Johnson Mach. Co., Carlyle, Manchester, Conn.
Koven & Bros., L. O., Jersey City, N. J.
Lincoln Mach. Co., Pawtucket, R. I.
Linde Air Products Co., The N. Y. C.
Meisel Press Mfg. Co., Boston
National Twist Drill & Tool Co., Detroit
Phonograph Needle Mfg. Co., Providence
U. S. Tool Co., Ampere, N. J.
Waltham Mach. Wks, Waltham, Mass.

CONTROLLERS and Starters, Electric
Fairbanks, Morse & Co., Chicago
General Electric Co., Schenectady, N. Y.
Westinghouse Electric and Mfg. Co., E. Pittsburgh

CONTROLLERS, Temperature
Brown Instr. Co., Philadelphia

CONTOUR MACHINES
Continental Mach. Specialties Co., Minneapolis, Minn.

CONVERTORS
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., E. Pittsburgh

COPPER
Cerro de Pasco Copper Corp., N. Y. C.

COTTER PINS
Standard Tool Co., Cleveland

COUNTERBORES
Cleveland Twist Drill Co., Cleveland
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Scully-Jones & Co., Chicago
Slocomb Co., J. T., Providence, R. I.

COUNTERSHAFTS
Rivett Lathe & Grinder, Inc., Boston

COUNTERSINKS
American Swiss File & Tool Co., Elizabeth, N. J.
Cleveland Twist Drill Co., Cleveland
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Scully-Jones & Co., Chicago

COUNTERS and Counting Machines
Veeder-Root Inc., Hartford, Conn.

COUPLINGS, Hose
Chicago Pneumatic Tool Co., N. Y. C.

COUPLINGS, Flexible
Cullman Wheel Company, Chicago
Link-Belt Co., Chicago
Morse Chain Co., Ithaca, N. Y.
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Philadelphia Gear Wks., Phila.

CRANES
Curtis Pneumatic Machy Co., St. Louis

CUTTER Blades, Milling, Boring & Reaming
Williams & Co., J. H., Buffalo, N. Y.

CUTTERS, Bar
Buffalo Forge Co., Buffalo, N. Y.

CUTTERS, Die Sinking
Pratt & Whitney (Div. Niles-Bement-Pond Co.,) Hartford, Conn.

CUTTERS, Gear
Brown & Sharpe Mfg. Co., Providence
Fellows Gear Shaper Co., Springfield, Vt.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Broach & Mach. Co., Detroit
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.

CUTTERS, Keyseater
Davis Keyseater Co., Rochester, N. Y.
National Mach. Tool Co., Cincinnati

CUTTERS, Milling
Brown & Sharpe Mfg. Co., Providence
Firth-Sterling Steel Co., McKeesport, Pa.
Kearney & Trecker Corp., Milwaukee, Wis.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Co. (Div. Niles-Bement-Pond, Hartford, Conn.
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.
Whitney Chain & Mfg. Co., Hatford, Conn.

WHERE-TO-BUY DIRECTORY

A Classified Index of Advertisers in this Issue

CUTTERS, Thread Milling
Pratt & Whitney (Div. Niles-Bennett-Pond Co., Hartford, Conn.

CUTTERS, Pipe, Hand
Armstrong Bros. Tool Co., Chicago
Ridge Tool Co., Elyria, O.

CUTTING Apparatus, Oxygen, Acetylene
Air Reduction Sales Co., N. Y. C.
Linde Air Products Co., The, N. Y. C.

CUTTING-OFF Machines
Brown & Sharpe Mfg. Co., Providence
Etna Mach. Co., Toledo, O.
Landis Mach. Co., Waynesboro, Pa.

CUTTING-OFF Machines, Cold Saw
Consolidated Mach. Tool Corp., Rochester, N. Y.
Modern Tool Wks., Rochester, N. Y.

CUTTING-OFF Tools
Williams & Co., J. H., Buffalo, N. Y.

CYLINDERS, Hydraulic
American Hollow Boring Co., Erie, Pa.

DEALERS Machinery (See Searchlight Section)
Bernstein & Co., George M., Chicago, Ill.
Delta Equipment Co., Phila.
Duquesne Electric Mfg. Co., Pittsburgh, Pa.
Eastern Mach. Co., Cincinnati
Emerman & Co., Louis E., Chicago
Falk Mill Supply Co., Inc., Rochester, N. Y.
Ganey Machinery Co., Buffalo, N. Y.
George & Co., James W., Detroit, Mich.
Hill Clarke Mach. Co., Chicago
Hyman & Sons, Jos., Phila.
Indianapolis Machy. & Supply Co., Indianapolis, Ind.
Industrial Machy. Co., Indianapolis, Ind.
Interstate Machy. Co., Chicago
Iroquois Machy. Co., Buffalo, N. Y.
Lucas & Son Inc., J. L., Bridgeport, Conn.
Marr-Galbreath Machy Co, Pittsburgh
McDonald Machy Co, St Louis
Midwest Machy Co., Chicago, Ill.
Miles Machy. Co., Saginaw, W. S., Mich.
Morey & Co., Inc., N. Y. C.
Motor Repair & Mfg. Co., Cleveland
Norton B'way Mchy Co., Cincinnati
O'Brien Machy. Co., Phila.
Osborne & Sexton Machy. Co., Columbus, O.
Ott Machy. Sales Co., Detroit
Simmons Mach. Tool Corp., Albany, N. Y.
Strong, Carlisle & Hammond Co., Cleveland
Sun Machy. Co., Inc., Newark, N. J.
Victor Machinery Co., Chicago, Ill.
West Penn Machy. Co., Pittsburgh

DEGREASING MACHINES
Blakeslee Co. G. S., Chicago

DEMAGNETIZERS
L-W Chuck Co., Toledo
Walker Co., O. S., Worcester, Mass.

DIAMONDS, Industrial
Gilmore and Co, F F, Boston

DIE-CASTING Dies
Madison-Kipp Corp., Madison, Wis.

DIE-CASTING Machines
Kux-Lohner Machine Co, Chicago
Madison-Kipp Corp., Madison, Wis.

DIE HEADS, Self Opening
Nation Acme Co, Cleveland

DIE-MAKING Machines
Gorton Machine Co., Geo., Racine, Wis.
Haskins Co., R. G., Chicago
Oliver Instrument Co., Adrian, Mich.

DIE Makers Supplies
Baumbach Mfg. Co., E. A., Chicago
Danly Mach. Specialties Co., Inc., Chicago
U. S. Tool Co., Ampere, N. J.

DIE Sets
U. S. Tool Co., Ampere, N. J.

DIE Sinking Machines
Cincinnati Milling Mach. Co., Cincinnati

DIES
Cerro de Pasco Copper Corp., N. Y. C.
Firth-Sterling Steel Co., McKeesport, Pa.

Dies, Adjustable and Self Opening
Eastern Mach. Screw Corp., New Haven, Conn.
Errington Mech. Lab., Staten Island, N. Y.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit
National Acme Co., Cleveland

DIES, Roll Thread
Pratt & Whitney Div., Niles-Bennett-Pond Co., Hartford, Conn.

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Butterfield Div. Union Twist Drill Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mach. Co., New Bedford, Mass.

DIES, Steel Marking
Noble & Westbrook Mfg. Co., Hartford, Conn.

DISKS
Metal Craft Corp., H. K., N. Y. C.

DIVIDERS
Brown & Sharpe Mfg. Co., Providence, R. I.

DIVIDING Heads
Scherr Co., Geo., N. Y. C.

DOGS, Lathe and Milling Machines
Armstrong Bros. Tool Co., Chicago
Ready Tool Co., Bridgeport, Conn.
Williams & Co., J. H., Buffalo, N. Y.

DRESSERS, Grinding Wheel
American Swiss File & Tool Co., Elizabeth, N. J.
Desmond-Stephan Mfg. Co., Urbana, O.
Gilmore & Co., F. F., Boston, Mass.
Norton Co., Worcester, Mass.
Standard Tool Co., Cleveland

DRILL Stands
Black and Decker Mfg. Co., Towson, Md.

DRILLING and Tapping Heads, Multiple
Baker Bros., Inc., Toledo
Buffalo Forge Co., Buffalo, N. Y.
Buhr Mach. Tool Co., Ann Arbor, Mich.
Bullard Co., Bridgeport, Conn.

DRILLING and Tapping Machines, Multiple
Errington Mech. Lab., Staten Island, N. Y.

DRILLING and Tapping Units
Baker Bros., Inc., Toledo

DRILLING Machines
Procunier Safety Chuck Co., Chicago

DRILLING Machines, Automatic and Semi-Automatic
Baker Bros., Inc., Toledo
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Buffalo Forge Co., Buffalo, N. Y.
Delta Mfg. Co., Milwaukee

DRILLING Machine, Deep Hole
Pratt & Whitney Div., Niles-Bennett-Pond Co., Hartford, Conn.

DRILLING Machines, Electric and Pneumatic
Chicago Pneumatic Tool Co., N. Y. C.

DRILLING Machines, Gang
Baker Bros., Inc., Toledo
Barnes Drill Co., Rockford
Barnes Co., W. F. & John, Rockford, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Bickford Tool Co., Cincinnati
Foote-Burt Co., Cleveland

DRILLING Machines, Heavy Duty
Barnes Co., W. F. & John, Rockford Ill.
Baker Bros., Inc., Toledo
Barnes Drill Co., Rockford
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Bickford Tool Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Foote-Burt Co., Cleveland
Modern Tool Wks., Rochester, N. Y.

DRILLING Machines, Horizontal
Baker Bros., Inc., Toledo
Kingsbury Mach. Tool Corp., Keene, N. H.

DRILLING Machines, Multiple Spindle
Baker Bros., Inc., Toledo
Baush Mach. Tool Co., Springfield, Mass.
Buffalo Forge Co., Buffalo, N. Y.

DRILLING Machines, Radial
American Tool Wks., Co., Cincinnati
Carlton Mach. Tool Co., Cincinnati
Cincinnati Bickford Tool Co., Cincinnati
Dreses Mfg. Co., Cincinnati

DRILLING Machines, Sensitive
Barnes Co., W. F. & John, Rockford, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Dumore Co., Racine, Wis.
Kingsbury Mach. Tool Corp., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.

DRILLING Machines, Turret
Kingsbury Mach. Tool Corp., Keene, N. H.
National Automatic Tool Co., Richmond, Ind.

DRILLING Machines, Upright Multiple Spindle
Baker Bros., Inc., Toledo
Barnes Drill Co., Rockford
Barnes Co., W. F. & John, Rockford, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Bickford Tool Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Foote-Burt Co., Cleveland
Grant Mfg. & Mach. Co., Bridgeport, Conn.
Kingsbury Mach. Tool Corp., Keene, N. H.
Modern Tool Wks., Rochester, N. Y.
National Automatic Tool Co., Richmond, Ind.
Pratt & Whitney Co., Niles-Bement-Pond, Hartford, Conn.

DRILLING Machines, Vertical
Baker Bros., Inc., Toledo
Barnes Drill Co., Rockford
Barnes Co., W. F. & John, Rockford, Ill.
Foote-Burt Co., Cleveland
Leland-Gifford Co., Worcester, Mass.

DRILLS
Cleveland Twist Drill Co., Cleveland
Firth-Sterling Steel Co., McKeesport, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Detroit

DRILLS, Brick, Stone, Cement, etc.
Armstrong Bros. Tool Company, Chicago

DRILLS, Center
Cleveland Twist Drill Co., Cleveland
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Slocomb Co., J. T., Providence, R. I.
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.

DRILLS, Pneumatic
Dumore Co., Racine, Wis.
Ingersoll-Rand Co., N. Y. C.

DRILLS, Portable Electric
Black and Decker Mfg. Co., Towson, Md.
Chicago Pneumatic Tool Co., N. Y. C.
Dumore Co., Racine, Wis.
Ingersoll-Rand Co., N. Y. C.

DRILLS, Ratchet
Armstrong Bros. Tool Co., Chicago
Cleveland Twist Drill Co., Cleveland
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Union Twist Drill Co., Athol, Mass.

DRILLS, Twist and Flat
Cleveland Twist Drill Co., Cleveland
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.

ELECTRICAL Instruments
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

ELECTRICAL Supplies
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

ELECTRODES, Welding
Lincoln Electric Co., Cleveland

END MILLS
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., Cleveland
Gammons-Holman Co., Manchester, Conn.
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago

ENGINES, Diesel, Oil, Gas, Steam
Allis-Chalmers Mfg. Co., Milwaukee
Chicago Pneumatic Tool Co., N. Y. C.
Fairbanks, Morse & Co., Chicago

ENGINES, Die Set
Fairbanks, Morse & Co., Chicago

ENGRAVING MACHINERY
Gorton Mach. Co., Geo., Racine, Wis.

EXTRACTORS, Broken Tap
Walton Co., Hartford, Conn.

EYE Bolts
Williams & Co., J. H., Buffalo, N. Y.

FACE Plates
Brown & Sharpe Mfg. Co., Providence

FANS, Electric
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

FANS, Exhaust
Buffalo Forge Co., Buffalo, N. Y.

FELT, Washers, Pads, Wicks
Felters Co., Boston, Mass.

FILES and Rasps
Nicholson File Co., Providence

FILES, Precision
American Swiss File & Tool Co., Elizabeth, N. J.

WHERE-TO-BUY DIRECTORY

A Classified Index of Advertisers in this Issue

FILING Machines
Continental Mach. Specialties Co., Minneapolis, Minn.
Cochrane Bly Co., Rochester N. Y.
Haskins Co., R. G., Chicago
Oliver Instrument Co., Adrian, Mich.

FITTINGS, Hydraulic
Elmes Engineering Works, Chas. F., Chicago

FLEXIBLE Shaft Equipment
Haskins Co., R. G., Chicago
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.
Strand & Co., N. A., Chicago

FORGES
Buffalo Forge Co., Buffalo, N. Y.

FORGINGS
Allis-Chalmers Mfg. Co., Milwaukee
Williams & Co., J. H., Buffalo, N. Y.

FORGING Machinery
Acme Mach. Co., Cleveland

FORGINGS Aluminum
Aluminum Co. of America, Pittsburgh

FORGINGS, Brass
Revere Copper & Brass Inc., N. Y. C.

FORGINGS, Copper, Brass & Bronze
Williams & Co., J. H., Buffalo, N. Y.

FORGINGS, Hollow Bored
American Hollow Boring Co., Erie Pa.

FOUNDRY Equipment & Supplies
Dixon Crucible Co., Joseph, Jersey City, N. J.

FRICTION Pulleys
Brown & Sharpe Mfg. Co., Providence, R. I.

FURNACEES
Baker & Co., Inc., Newark, N. J.

FURNACES, BRAZING
Firth-Sterling Steel Co., McKeesport, Pa.

FURNACES, Electric
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

FURNACES, Gas
Hones, Inc., Chas. A., Baldwin, L. I.

FURNACES, Forging
Ingersoll Rand Co., Phillipsburgh, N. J.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

FURNACE, Heat-Treating, Tempering and Annealing
American Gas Furnace Co., Elizabeth, N. J.
General Electric Co., Schenectady, N. Y.
Hones Inc., Chas. A., Baldwin, N. Y.
Hoskins Mfg. Co., Detroit
Strong Carlisle & Hammond Co.
Surface Combustion Co., Toledo, O
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

FURNACES, Melting
Hones, Inc., Chas. A., Baldwin, L. I.

FURNACES, Soldering
Hones Inc., Chas. A., Baldwin, N. Y.

FURNITURE, Machine Shop

GAGE BLOCKS
Ford Motor Co., (Johansson Div.) Dearborn, Mich.
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.

GAGES
Brown & Sharpe Mfg. Co., Providence, R. I.

GAGES, Comparator
Bausch & Lomb Optical Co., Rochester, N. Y.
Jones & Lamson Mach. Co., Springfield, Vt.
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Geo., N. Y. C.

GAGES, Depth
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., Providence
Mufkin Rule Co., Saganaw, Mich.

GAGES, Dial
Ames Co., B. C., Waltham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., Providence
Randall & Stickney, Waltham, Mass.
Starrett Co., L. S., Athol, Mass.

GAGES, Electrical
Pratt & Whitney Div., Niles-Bement-Pond, Hartford, Conn.

GAGES, Plug and Ring
Brown & Sharpe Mfg. Co., Providence
Greenfield Tap & Die Corp., Greenfield Mass.
Hanson-Whitney Mach. Co., Hartford, Conn.
Pratt & Whitney Co., Div., Niles-Bement-Pond, Hartford, Conn.
Williams & Co., J. H., Buffalo, N. Y.

GAGES, Pressure
Brown Instr. Co., Philadelphia

GAGES, Snap and Cylindrical
Brown & Sharp Mfg. Co., Providence
Federal Products Corp., Providence
Ford Motor Co. (Johansson Div.) Dearborn, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hanson-Whitney Mach. Co., Hartford, Conn.
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.
Slocomb Co., J. T., Providence, R. I.
Williams & Co., J. H., Buffalo, N. Y.

GAGES, Standard
Ford Motor Co. (Johansson Div.) Dearborn, Mich.
Hanson-Whitney Mach. Co., Hartford, Conn.

GAGES, Surface
Brown & Sharpe Mfg. Co., Providence, R. I.

GAGES, Taper
Brown & Sharpe Mfg. Co., Providence, R. I.

GAGES, Temperature
Brown Instr. Co., Philadelphia

GAGES, Thickness
Brown & Sharpe Mfg. Co., Providence, R. I.
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Lufkin Rule Co., Saginaw, Mich.

GAGES, Thread
Brown & Sharpe Mfg. Co., Providence
Ford Motor Co. (Johansson Div.) Dearborn, Mich.
Lufkin Rule Co., Saginaw, Mich.
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.
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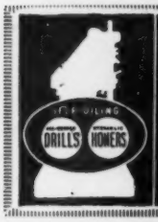

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A Classified Index of Advertisers in this Issue

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Adams Co., Dubuque, Ia.
Brown & Sharpe Mfg. Co., Providence
Fellows Gear Shaper Co., Springfield, Vt.
Gleason Works, Rochester, N. Y.
Lees-Bradner Co., Cleveland
National Broach & Mach. Co., Detroit
Scherr Co., Geo., N. Y. C.
Waltham Mach. Works, Waltham, Mass.,

GEAR Lapping Machines
Fellows Gear Shaper Co., Springfield, Vt.
National Broach & Mach. Co., Detroit

GEAR Measuring Machines
Fellows Gear Shaper Co., Springfield, Vt.
National Broach & Mach. Co., Detroit

GEAR Tempering Machines
Gleason Wks., Rochester, N. Y.

GEAR Testing Machines
Brown & Sharpe Mfg. Co., Providence, R. I.
Fellows Gear Shaper Co., Springfield, Vt.
Gleason Wks., Rochester, N. Y.
Lees-Bradner Co., Cleveland
National Broach & Mach. Co., Detroit

GEARS, Cast
Ganschow Gear Co., Chicago
General Electric Co., Schenectady, N. Y.
Grant Gear Works, Boston, Mass.
Hartford Special Machy. Co., Hartford, Conn.
Link-Belt Co., Chicago
Perkins Mach. & Gear Co., Springfield, Mass.
Philadelphia Gear Wks., Phila., Pa.

GEARS, Cut
Adams Company, Dubuque, Pa.
Baush Mach. Co., Springfield, Mass.
Brown & Sharpe Mfg. Co., Providence
Chicago Rawhide Mfg. Co., Chicago
Cincinnati Gear Co., Cincinnati
Earle Gear & Mach. Co., Phila., Pa
Fellows Gear Shaper Co., Springfield, Vt.
Ganschow Gear Co., Chicago.
Gear Specialties, Inc., Chicago
Gleason Wks., Rochester, N. Y.
Grant Gear Wks., Boston, Mass.
Hartford Special Machy. Co., Hartford, Conn.
James Co., D. O., Chicago
Johnson Mach. Co., Carlyle, Manchester, Conn.
Link-Belt Co., Chicago
Massachusetts Gear & Tool Co, Woburn, Mass
Meisel Press Mfg. Co., Boston, Mass.
Perkins Mach. & Gear Co., Springfield, Mass.
Philadelphia Gear Wks., Phila., Pa.
Stahl Gear & Mach. Co., N. Y. C.
Taylor Mach. Co., Cleveland

GEARS, Non-Metalic
Chicago Rawhide Mfg. Co., Chicago
James Co., D. O., Chicago
Massachusetts Gear & Tool Co, Woburn, Mass.
Perkins Mach. & Gear Co., Springfield, Mass.

GENERATORS, Acetylene
Linde Air Products Co., The, N. Y. C.
Union Carbide & Carbon Corp., N. Y. C.

GENERATORS, Electric
Century Electric Co., St. Louis
Fairbanks, Morse & Co., Chicago
General Electric Co., Schenectady, N. Y.
Reliance Electric & Engineering Co., Cleveland.

GRAPITE
Dixon Crucible Co., Joseph, Jersey City, N. J.

GREASE
Dixon Crucible Co., Joseph, Jersey City, N. J.
Gulf Refining Co., Pittsburgh
Socony-Vacuum Oil Co., N. Y. C
Sun Oil Co., Phila., Pa.

GRINDERS
Delta Mfg. Co., Milwaukee

GRINDERS, Bench
Black & Decker Mfg. Co., Towson, Md.
Hammond Mach'y Bldrs. Inc., Kalamazoo, Mich.

GRINDERS, Port, Electric
Black & Decker Mfg. Co., Towson, Md.

GRINDING Machines Attachments
Cincinnati Grinder, Inc., Cincinnati

GRINDING Machines, Abrasive Belt
Production Mach. Co, Greenfield, Mass.
Walls Sales Corp., N. Y. C.

GRINDING Machines, Bench
Hammond Mach'y Bldrs. Inc., Kalamazoo, Mich.
Norton Co., Worcester, Mass.
Walls Sales Corp., N. Y. C.

GRINDING Machines, Die
Madison-Kipp Corp., Madison, Wis.

GRINDING Machines, Discs
Production Mach. Co., Greenfield, Mass

GRINDING Machines, Bench
Union Twist Drill Co., Athol, Mass.

GRINDING Machines, Centerless
Cincinnati Grinders Inc., Cincinnati

GRINDING Machines, Chaser
Landis Mach. Co., Waynesboro, Pa.
National Acme Co., Cleveland

GRINDING Machines, Chucking
Blanchard Mach. Co., Cambridge, Mass.
Bryant Chucking Grinder Co., Springfield, Vt.
Heald Mach. Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.

GRINDING Machines, Contour
Baker Bros. Inc., Toledo

GRINDING Machines, Cutter & Tool
Bryant Chucking Grinder Co., Springfield, Vt.
Cincinnati Milling Mach. Co., Cincinnati
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Geometric Tool Co., New Haven, Conn.
Gorton Mach. Co., Geo., Racine, Wis.
Hammond Mach'y Bldrs. Inc., Kalamazoo, Mich.
Heald Mach. Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Le Blond Mach. Tool Co., R. K., Cincinnati
Norton Co., Worcester, Mass.
Oliver Instrument Co., Adrian, Mich.
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.
Sellers & Co., Inc., Wm., Philadelphia
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.

GRINDING Machines, Cylinder
Bryant Chucking Grinder Co., Springfield, Vt.
Heald Mach. Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.

GRINDING Machines, Cylindrical
Arter Grinding Machine Co., Worcester, Mass.
Brown & Sharpe Mfg. Co., Providence
Cincinnati Grinders Inc., Cincinnati,
Heald Mach. Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING Machines, Die
Abrasive Mach. Tool Co., E. Providence, R. I.
Arter Grinding Machine Co., Worcester, Mass.
Blanchard Mach. Co., Cambridge, Mass.
Bryant Chucking Grinder Co., Springfield, Vt.
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Heald Mach. Co., Worcester, Mass.
Landis Mach. Co., Waynesboro, Pa.
Murchey Mach. & Tool Co., Detroit
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.

WHERE-TO-BUY DIRECTORY

A Classified Index of Advertisers in this Issue

GRINDING Machines, Drill
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Oliver Instrument Co., Adrian, Mich.
Sellers & Co., Inc., Wm., Phila., Pa.

GRINDING Machines, Electric
Chicago Pneumatic Tool Co., N. Y. C.
Hammond Mach'y Bldrs. Inc., Kalamazoo, Mich.
Arter Grinding Machine Co., Worcester, Mass.
Madison-Kipp Corp., Madison, Wis.

GRINDING Machines, Face or Ring Wheel
Abrasive Mach. Tool Co., E. Providence, R. I.
Blanchard Mach. Co., Cambridge, Mass.

GRINDING Machines, Flexible Shaft
Haskins Co., R. G., Chicago

GRINDING Machines, Floor
Hammond Mach'y Bldrs, Inc., Kalamazoo, Mich.
Norton Co., Worcester, Mass.

GRINDING Machines, Gage
Abrasive Mach. Tool Co., E. Providence, R. I.
Landis Tool Co., Waynesboro, Pa.

GRINDING Machines, Gear
Lees-Bradner Co., Cleveland
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.

GRINDING Machines, Head and End
Arter Grinding Mach. Co., Worcester, Mass.

GRINDING Machines, Hole and Face
Bryant Chucking Grinder Co., Springfield, Vt.

GRINDING Machines, Hydraulic
Cincinnati Grinders Inc., Cincinnati

GRINDING Machines, Internal
Bryant Chucking Grinder Co., Springfield, Vt.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Rivett Lathe & Grinder, Inc., Boston, Mass.

GRINDING Machines, Lathe Attachment
Dumore Co., Racine, Wis.

GRINDING Machines, Piston Rings
Heald Machine Co., Worcester, Mass.

GRINDING Machines, Plain
Brown & Sharpe Mfg. Co., Providence
Cincinnati Grinders Inc., Cincinnati

GRINDING Machines, Pneumatic
Ingersoll-Rand Co., N. Y. C.
Madison-Kipp Corp., Madison, Wis.

GRINDING Machines, Portable
Chicago Pneumatic Tool Co., N. Y. C.
Dumore Co., Racine, Wis.
Ingersoll-Rand Co., N. Y. C.
Madison-Kipp Corp., Madison, Wis.

GRINDING Machines, Pulley
Abrasive Mach. Tool Co., E. Providence, R. I.

GRINDING Machines, Radius
Van Norman Mach. Tool Co., Springfield, Mass.

GRINDING Machines, Roll
Cincinnati Grinders, Inc., Cincinnati

GRINDING Machines, Surface
Arter Grinding Machine Co., Worcester, Mass.
Abrasive Mach. Tool Co., E. Providence, Mass.
Blanchard Mach. Co., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Gardner Mach. Co., Beloit, Wis.
Heald Machine Co., Worcester, Mass.
Norton Company, Worcester, Mass.
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.
Walker Co., O. S., Worcester, Mass.

GRINDING Machines, Tap
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Oliver Instrument Co., Adrian, Mich.

GRINDING Machines, Toolroom
Bryant Chucking Grinder Co., Springfield, Vt.
Hammond Mach'y Bldrs, Inc., Kalamazoo, Mich.

GRINDING Machines, Universal
Brown & Sharpe Mfg. Co., Providence
Chicago Pneumatic Tool Co., N. Y. C.
Cincinnati Grinders Inc., Cincinnati
Gallmeyer & Livingston, Co., Grand Rapids, Mich.
Gisholt Machine Co., Madison, Wis.
Le Blond Mach. Tool Co., R. K., Cincinnati
Norton Co., Worcester, Mass.

GRINDING Machines, Vertical
Blanchard Mach. Co., Cambridge, Mass.
Cincinnati Bickford Tool Co., Cincinnati
Walker Co., O. S., Worcester, Mass.

GRINDING Wheels
Blanchard Mach. Co., Cambridge, Mass.
Carburundum Co., Niagara Falls, N. Y.
Gardner Mach. Co., Beloit, Wis.
Macklin Co., Jackson, Mich.
Norton Co., Worcester, Mass.
Vitrified Wheel Co., Westfield, Mass.

GROUND Farm Tools, Gages, Snap, Thread, Etc.

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Victor Saw Works, Middletown, N. Y.

HAMMERS, Pneumatic
Chicago Pneumatic Tool Co., N. Y. C.
Ingersoll-Rand Co., N. Y. C.

HAMMERS, Portable Electric
Black & Decker Mfg. Co., Towson, Md.

HAMMERS, Power
Sellers & Co., Inc., Wm., Phila., Pa.

HAMMERS, Soft-faced
Greene Tweed & Co., N. Y. C.

HANDLES, Crank & Machine
Williams & Co., J. H., Buffalo, N. Y.

HANGERS
Brown & Sharpe Mfg. Co., Providence, R. I.

HANGERS, Shaft
Fafnir Bearing Co., New Britain, Conn.
Link-Belt Co., Chicago

HARDNESS Measuring Instruments
Bausch & Lomb Optical Co., Rochester, N. Y.
Shore Instrument & Mfg. Co., Jamaica, L. I.
Wilson Mech., Instrument Co., N. Y. C.

HEAT Treating
American Metal Treatment Co., Elizabeth, N. J.

HEAT Treating Baths
Holden Co., A. F., Detroit

HEAT Treating Instruments
Brown Instr. Co., Philadelphia

HOBBING Machines
Adams Company, Dubuque, Ia.
Brown & Sharpe Mfg. Co., Providence
Scherr Co., George, N. Y. C.

HOBS
Brown & Sharpe Mfg. Co., Providence
National Twist Drill & Tool Co., Detroit
Union Twist Drill Co., Athol, Mass.
Philadelphia Gear Wks., Phila., Pa.
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.

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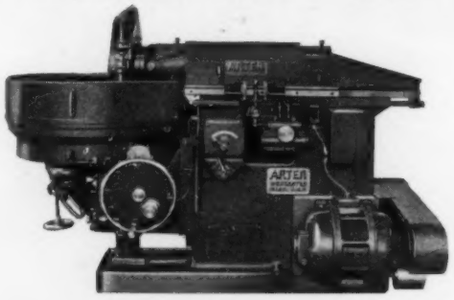

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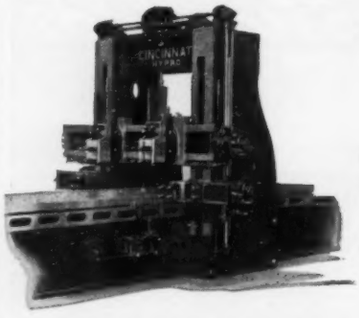

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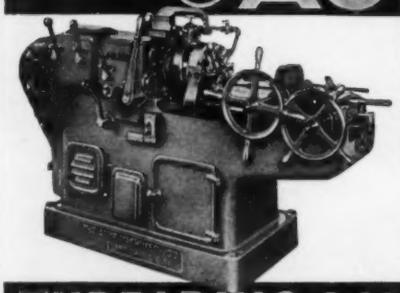

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A Classified Index of Advertisers in this Issue

HOISTS and Cranes, Pneumatic
Curtis Pneumatic Machy Co., St. Louis

HOISTS, Chain
Yale & Towne Mfg. Co., Philadelphia

HOISTS, Hand
Wright Mfg. Co. (Div. American Chain Co.), York, Pa.

HOISTS, Pneumatic
Chicago Pneumatic Tool Co., N. Y. C.

HOLDERS, Pneumatic
Chicago Pneumatic Tool Co., N. Y. C.

HONING Machines
Barnes Drill Co., Rockford
Micromatic Hone Corp., Detroit, Mich.

HOSE, Flexible and Metallic
Chicago Metal Hose Corp., Maywood, Ill.

HYDRAULIC Machinery
Eimes Engineering Works, Chas. F., Chicago
Oilgear Corp., Milwaukee, Wis.

HYGROMETERS
Brown Instr. Co., Philadelphia

ILLUMINATION, Industrial
General Electric Vapor Lamp Co., Hoboken, N. J.

INDICATORS
Koch Test Indicator, Nyack, N. Y.

INDICATOR, Dial
Federal Products Corp., Providence
Starrett Co., L. S., Athol, Mass.

INDICATORS, Speed and Test
Brown & Sharpe Mfg. Co., Providence
Veeder-Root, Inc., Hartford, Conn.

INSTRUMENTS, Light Wave
Bausch & Lomb Optical Co., Rochester, N. Y.

INSULATION, Sound and Vibration
Felters Co., Boston, Mass.

JOINTS, Universal
Bausch Mach. Tool Co., Springfield, Mass.
Gray & Prior Mach. Co., Hartford, Conn.
National Automatic Tool Co., Richmond, Ind.

KEYS, Machine
Whitney Chain & Mfg. Co., Hartford, Conn.

KEYS, Woodruff
Whitney Chain & Mfg. Co., Hartford, Conn.

KEYSEATING Machines
Baker Bros., Inc., Toledo
Davis Keyseater Co., Rochester, N. Y.
Mitts & Merrill, Saginaw, Mich.
National Mach. Tool Co., Cincinnati

KEYWAY Broaches
Connecticut Broach & Mach. Co., New London, Conn.

KNURLS & Knurl Holders
American Swiss File & Tool Co., Elizabeth, N. J.
Williams & Co., J. H., Buffalo, N. Y.

LACE, Leather
Rhoads & Sons, J. E., Phila.

LAMPS, Electric
General Electric Co., Schenectady, N. Y.
General Electric Vapor Lamp Co., Hoboken, N. J.
Westinghouse Electric & Mfg. Co., E. Pittsburgh

LAPPING Machines, Centerless
Cincinnati Grinders Inc., Cincinnati

LAPPING Machines, Cylindrical and Flat
Norton Co., Worcester, Mass.

LATHE Attachments
Gisholt Machine Co., Madison, Wis.

LATHE Tools
Cincinnati Lathe & Tool Co., Oakley, Cincinnati
Cleveland Twist Drill Co., Cleveland
Gisholt Machine Co., Madison, Wis.
National Broach & Mach. Co., Detroit
R & L Tools, Nicetown, Phila.
Ready Tool Co., Bridgeport, Conn.

LATHES
Cincinnati Lathe & Tool Co., Oakley, Cincinnati

LATHES, Automatic and Semi-Automatic
Bullard Co., Bridgeport, Conn.
Gisholt Mach. Co., Madison, Wis.
Jones & Lamson Mach. Co., Springfield, Mass.
Le Blond Mach. Tool Co., R. K., Cincinnati
Lodge & Shipley Mach. Tool Co., Cincinnati
National Acme Co., Cleveland
Potter & Johnston Mach. Co., Pawtucket, R. I.
Pratt & Whitney Co., Div., Niles-Bement-Pond, Hartford, Conn.

LATHES, Bench
Ames Co., B. C., Waltham, Mass.
Atlas Press Co., Kalamazoo, Mich.
LeBlond Mach. Tool Co., R. K., Cincinnati
Pratt & Whitney Co., Div. Niles-Benett-Pond Co., Hartford, Conn.
Rivett Lathe & Grinder, Inc., Boston
South Bend Lathe Works, South Bend, Ind.

LATHES, Brass Workers
Gesholt Machine Co., Madison, Wis.

LATHES, Engine
American Tool Works Co., Cincinnati
Cincinnati Lathe & Tool Co., Oakley, Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Le Blond Mach. Tool Co., R. K., Cincinnati, O.
Lodge & Shipley Mach. Tool Co., Cincinnati, O.
Modern Tool Works, Rochester, N. Y.
Monarch Mach. Tool Co., Sidney, O.
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.
South Bend Lathe Works, South Bend, Ind.
Springfield Mach. Tool Co., Springfield.

LATHES, Horizontal and Vertical Turret
Gisholt Mach. Co., Madison, Wis.
Warner & Swasey Co., Cleveland

LATHES, Toolroom
American Tool Wks. Co., Cincinnati
Atlas Press Co., Kalamazoo, Mich.
Cincinnati Lathe & Tool Co., Oakley, Cincinnati
Le Blond Mach. Tool Co., R. K., Cincinnati
Lodge & Shipley Mach. Tool Co., Cincinnati
Monarch Mach. Tool Co., Sidney, O.
Pratt & Whitney Co., Div., Niles-Bement-Pond, Hartford, Conn.
Sebastian Lathe Co., Cincinnati, O.
South Bend Lathe Works, South Bend, Ind.
Springfield Mach. Tool Co., Springfield, O.

LATHES, Vertical Turret
Bullard Co., Bridgeport, Conn.

LATHES, Wheel, R. R.
Sellers & Co., Inc., Wm., Phila., Pa.

LEATHER, Hydraulic
Chicago Rawhide Mfg. Co., Chicago

LIGHT Bulbs
Westinghouse Elec. & Mfg. Co. (Mazda Lamp Div.), E. Pittsburgh

LOCK Washers
American Nut & Bolt Fastener Co., Pittsburgh
Real Tool Co., East Alton, Ill.
Butcher & Hart Mfg. Co., Toledo
Eaton Mfg. Co., Massillion, O.
Hobbs Mfg. Co., Worcester, Mass.
National Lock Washer Co., Newark, N. J. and Milwaukee, Wis.
Philadelphia Steel & Wire Corp., Germantown, Phila.
Positive Lock Washer Co., Newark, N. J.
Ryerson & Sons, Inc., J. T., Chicago
Washburn Co., Worcester, Mass.

WHERE-TO-BUY DIRECTORY

A Classified Index of Advertisers in this Issue

LUBRICANTS
Dixon Crucible Co., Joseph, Jersey City, N. J.
Gulf Refining Co., Pittsburgh
Oakite Products, Inc., N. Y. C.
Shell Corp., N.. Y. C.
Socony-Vacuum Oil Co., Inc., N. Y. C.
Stuart Co., D. A., Chicago
Sun Oil Co., Phila., Pa.

LUBRICATING Systems
Bijur Lub. Corp., Long Island City, N. Y.
Madison-Kipp Corp., Madison, Wis.
Rivett Lathe & Grinder, Inc., Boston

MACHINES, Shapecutting Oxy-Acetylene
Linde Air Products Co., N. Y. C.
Union Carbide & Carbon Corp., N. Y. C.

MACHINE Automatic Toolroom
Pratt & Whitney Div., Niles-Bennett-Pond Co., Hartford, Conn.

MANDRELS
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co, Cleveland
Firth-Sterling Steel Co., McKeesport, Pa.
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.

MANDRELS, Erpanding
Nicholson & Co., W. H., Wilkes-Barre, Pa.

MARKING MACHINES
Noble & Westbrook Mfg. Co., Hartford, Conn.

MEASURING Instruments
Norma-Hoffman Bearings Corp., Stamford, Conn.
Scherr Co., George, N. Y. C.

MEASURING Machines
Hanson-Whitney Mach. Co., Hartford, Conn.

MELTING Pots
Hones, Inc., Chas. A., Baldwin, N. Y.

METAL, Perforated
Ryerson & Son, Inc., J. T., Chicago

METALLIC Tubing, Flexible
Titeflex Metal Hose Co., Newark, N. J.

METERS, Flow
Brown Instr. Co., Philadelphia

METERS, Welding
Lincoln Electric Co., Cleveland

MICROMETERS
Brown & Sharpe Mfg. Co., Providence
Lufkin Rule Co., Saginaw, Mich.
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.
Slocomb Co., J. T., Providence, R. I.
Starrett Co., L. S., Athol, Mass.

MICROSCOPES, Inspection, Tool Makers
Bausch & Lomb Optical Co., Rochester, N. Y.

MILLING Attachments
Adams Co., Dubuque, Ia.
Brown & Sharpe Mfg. Co., Providence
Cincinnati Milling Mach. Co., Cincinnati
Kearney & Trecker Corp., Milwaukee, Wis.
Potter & Johnston Mach. Co., Pawtucket, R. I.

MILLING Machine Arbors
Scully-Jones & Co., Chicago

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Brown & Sharpe Mfg. Co., Providence
Cincinnati Milling Mach. Co., Cincinnati
Kearney & Trecker Corp., Milwaukee, Wis.
U. S. Tool Co., Ampere, N. J.

MILLING Machines, Bench
Ames Co., B. C., Waltham, Mass.
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.
Sundstrand Mach. Tool Co., Rockford, Ill.

MILLING Machines, Continuous
Consolidated Mach. Tool Corp., Rochester, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Modern Tool Wks., Rochester, N. Y.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Sundstrand Mach. Tool Co., Rockford, Ill.

MILLING Machines, Drum Type
Consolidated Mach. Tool Corp., Rochester, N. Y.
Modern Tool Wks., Rochester, N. Y.

MILLING Machines, Duplex
Cincinnati Milling Mach. Co., Cincinnati
Kearney & Trecker Corp., Milwaukee, Wis.
Van Norman Mach. Tool Co., Springfield, Mass.

MILLING Machines, Floor Type
Sellers & Co., Inc., Wm., Phila., Pa.

MILLING Machines, Hand
Brown & Sharpe Mfg. Co., Providence
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.

MILLING Machines, Multiple Spindle
Cincinnati Milling Mach. Co., Cincinnati

MILLING Machines, Plain
Brown & Sharpe Mfg. Co., Providence
Cincinnati Milling Mach. Co., Cincinnati
Kearney & Trecker Corp., Milwaukee, Wis.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Sundstrand Mach. Tool Co., Rockford, Ill.

MILLING Machines, Planetary
Consolidated Mach. Tool Corp., Rochester, N. Y.
Modern Tool Wks., Rochester, N. Y.

MILLING Machines, Planer Type
Cincinnati Planer Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Modern Tool Wks., Rochester, N. Y.
Niles Tool Wks. Co., Hamilton, O.
Putnam Mach. Co., Hamilton, O.
Sellers & Co., Inc., Wm., Phila., Pa.

MILLING Machines, Precision Brush
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.

MILLING Machines, Profile
Consolidated Mach. Tool Corp., Rochester, N. Y.
Modern Tool Wks., Rochester, N. Y.

MILLING Machines, Thread
Adams Co., Dubuque, Iowa
Hanson-Whitney Mach. Co., Hartford, Conn.
Lees-Bradner Co., Cleveland
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.

MILLING Machines, Universal
Brown & Sharpe Mfg. Co., Providence
Cincinnati Milling Mach. Co., Cincinnati
Gorton Mach. Co., Geo., Racine, Wis.
Kearney & Trecker Corp., Milwaukee, Wis.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Sundstrand Mach. Tool Co., Rockford, Ill.
Van Norman Mach. Tool Co., Springfield, Mass.

MILLING Machines, Vertical
Brown & Sharpe Mfg. Co., Providence
Cincinnati Milling Mach. Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Gorton Mach. Co., Geo., Racine, Wis.
Kearney & Trecker Corp., Milwaukee, Wis.
Modern Tool Works, Rochester, N. Y.
Potter & Johnson Mach. Co., Pawtucket, R. I.
Sundstrand Mach. Tool Co., Rockford, Ill.
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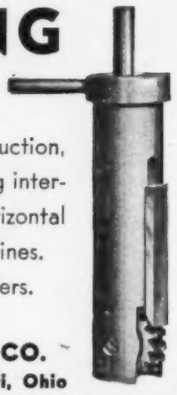

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WHERE-TO-BUY DIRECTORY

A Classified Index of Advertisers in this Issue

MILLING Machines, Worm
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.

MILLIVOLTMETERS
Brown Instr. Co., Philadelphia

MOTORS, Electric
Allis-Chalmers Mfg. Co., Milwaukee
Century Electric Co., St. Louis
Dumore Co., Racine, Wis.
Fairbanks, Morse & Co., Chicago
General Electric Co., Schenectady, N. Y.
Reliance Electric & Engineering Co., Cleveland
Westinghouse Electric & Mfg. Co., E. Pittsburgh

NITROGEN Gas
Air Reduction Sales Co., N. Y. C.
Linde Air Products Co., The, N. Y. C.

NUMBERING Machines
Noble & Westbrook Mfg. Co., Hartford, Conn.

NUT Runners, Port, Electric
Black & Decker Mfg. Co., Towson, Md.

NUTS, Castellated
National Acme Co., Cleveland

OIL and Grease Cups
Gits Bros. Mfg. Co., Chicago

OIL Extractors, Centrifugal
Barrett Co., Leon J., Worcester, Mass.

OIL Grooving Machines
National Mach. Tool Co., Cincinnati

OIL Seals
Chicago Rawhide Mfg. Co., Chicago

OIL Stones
Norton Co., Worcester, Mass.

OILS, Cutting
Shell Corp., N. Y. C.
Socony-Vacuum Oil Co., Inc., N. Y. C.
Stuart Co., D. A., Chicago

OILS, Lubricating
Socony-Vacuum Oil Co., Inc., N. Y. C.
Stuart Co., D. A., Chicago
Swan-Finch Oil Corp., N. Y. C.

OILS, Quenching
Stuart Co., D. A., Chicago

OXYGEN Gas
Air Reduction Sales Co., N. Y. C.
Linde Air Products Co., The, N. Y. C.

PAINTS, Machinery
Dixon Crucible Co., Joseph, Jersey City, N. J.

PARALLELS
Brown & Sharpe Mfg. Co., Providence, R. I.
Starrett Co., L. S., Athol, Mass.
Walker Co., O. S., Worcester, Mass.

PENCILS
Dixon Crucible Co., Joseph, Jersey City, N. J.

PILLOW Blocks
Fafnir Bearing Co., New Britain, Conn.
Link-Belt Co., Chicago

PIPE, Cutters, Hand
Ridge Tool Co., Elyra, O.

PIPE Cutting and Threading Machines
Merrell Mfg. Co., Toledo
Murchey Mach. & Tool Co., Detroit
Oster Mfg. Co., Cleveland

PIPE Fitters, Tool
Greenfield Tap & Die Corp., Greenfield, Mass.
Standard Tool Co., Cleveland
Williams & Co., J. H., Buffalo, N. Y.

PIPE Plugs
Allen Mfg. Co., Hartford, Conn.

PIPE Steel
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh

PLANING Machines
Cincinnati Planer Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Modern Tool Wks., Rochester, N. Y.
Niles Tool Wks. Co., Hamilton, O.
Putnam Mach. Co., Hamilton, O.
Sellers & Co., Inc., Wm., Phila., Pa.

PLATES, Aluminum
Aluminum Co. of America, Pittsburgh

PLATES, Steel
Carnegie-Illinois Steel Corp, Pittsburgh
Jones & Laughlin Steel Corp., Pittsburgh

PNEUMATIC Tools
Ingersoll-Rand Co., N. Y. C.

POLISHING and Buffing Machines
Chicago Pneumatic Tool Co, N. Y. C.
Dumore Co., Racine, Wis.
Hammond Machy. Builders, Kalamazoo, Mich.
Haskins Co., R. G., Chicago
Heald Mach. Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.
Production Mach. Co.,, Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.

POLISHING Grains, Abrasive
Carborundum Co., Niagara Falls, N. Y.

POTENTIOMETERS
Brown Instr. Co., Philadelphia

PRESS Feeds
U. S. Tool Co., Ampere, N. J.
V & O Press Co., Hudson, N. Y.

PRESSES, Arbor
Barnes Co., W. F. & John, Rockford, Ill.
Nicholson & Co., W. H., Wilkes-Barre, Pa.

PRESSES, Forcing
Barnes Co., W. F. & John, Rockford, Ill.
Elmes Engineering Works, Chas. F., Chicago
Lucas Mach. Tool Co., Cleveland
Oilgear Corp., Milwaukee, Wis.

PRESSES, Hydraulic
Elmes Engineering Works, Chas. F., Chicago
Oilgear Corp., Milwaukee, Wis.

PRESSES, Power
Cincinnati Shaper Co., Cincinnati
Oilgear Corp., Milwaukee, Wis.
Perkins Mach. Co., Warren, Mass.
V & O Press Co., Hudson, N. Y.
Zeh & Hanhemann Co., Newark, N. J.

PRESSES, Screw
Barnes Co., W. F. & John, Rockford, Ill.

PRESSES, Tablet
Kux-Lohner Mach. Co., Chicago

PROFILING Machines
Gorton Mach. Co., Geo., Racine, Wis.

PROTRACTORS
Bausch & Lomb Optical Co., Rochester, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.

PULLEYS
Allis-Chalmers Mfg. Co., Milwaukee
Johnson Mach. Co., Carlyle, Manchester, Conn.

PUMPS
Brown & Sharpe Mfg. Co., Providence, R. I.

WHERE-TO-BUY DIRECTORY

A Classified Index of Advertisers in this Issue

PUMPS, Centrifugal
Allis-Chalmers Mfg. Co., Milwaukee
Brown & Sharpe Mfg. Co., Providence

PUMPS, Hydraulic
Elmes Engineering Works, Chas. F., Chicago
Fairbanks, Morse & Co., Chicago
Oilgear Corp., Milwaukee, Wis.

PUMPS Lubricants
Brown & Sharpe Mfg. Co., Providence
Fairbanks, Morse & Co., Chicago
Ruthman Mach. Co., Cincinnati

PUMPS, Oil
Brown & Sharpe Mfg. Co., Providence
Fairbanks, Morse & Co., Chicago
Fulflo Specialties Co., Inc., Blanchester, Ohio
Ruthman Mach. Co., Cincinnati, O.

PUMPS, Portable
National Acme Co., Cleveland

PUMPS, Power
Fairbanks, Morse & Co., Chicago
Oilgear Corp., Milwaukee, Wis.

PUNCHES, Center
Lufkin Rule Co., Saginaw, Mich.
Starrett Co., L. S., Athol, Mass.

PUNCHES, Power
Mitts & Merrill, Saginaw, Mich.
Wiedemann Mach. Co., Phila., Pa.

PUNCHING and Shearing Machines
Consolidated Mach. Tool Corp., Rochester, N. Y.
Modern Tool Wks., Rochester, N. Y.

PYROMETERS
Pyrometer Instr. Co., N. Y. C.

PYROMETERS, Controlling
Brown Instrument Co., Phila., Pa.
Hoskins Mfg. Co., Detroit

PYROMETERS, Optical
Brown Instr. Co., Philadelphia

PYROMETERS, Recording
Brown Instrument Co., Phila., Pa.

REAMERS
Firth-Sterling Steel Co., McKeesport, Pa.
National Twist Drill & Tool Co., Detroit

REAMERS, Adjustable
Butterfield Div. Union Twist Drill Co., Derby Line, Vt.
Cleveland Twist Drill Co., Cleveland
Gammons-Holman Co., Manchester, Conn.
Gisholt Mach. Co., Madison, Wis.
Greenfield Tap & Die Corp, Greenfield, Mass
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Hartford Conn. (Div. Niles-Bement-Pond.)

REAMERS, Solid
Butterfield Div. Union Twist Drill Co., Derby Line, Vt.
Cleveland Twist Drill Co., Cleveland
Gammons-Holman Co., Manchester, Conn.
Gesholt Machine Co., Madison, Wis.
Greenfield Tap and Die Corp., Greenfield, Mass.
Holman Reamer Co., Manchester, Conn.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.

REAMING Machines
Blanchard Mach. Co., Cambridge, Mass.
Van Norman Mach. Tool Co., Springfield, Mass.
Brown Instr. Co., Philadelphia

RECTIFIERS, Mercury Arc
Allis-Chalmers Mfg. Co., Milwaukee

RECTIFIERS, Power
Allis-Chalmers Mfg. Co., Milwaukee

REFRACTORIES
Carborundum Co., Niagara Falls

REGULATORS Acetylene, Oxygen
Linde Air Products Co., N. Y. C.
Union Carbide & Carbon Corp., N. Y. C.
Allen-Bradley Co., Milwaukee

RHEOSTATS
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

RIVETING Machines
Chicago Pneumatic Tool Co., N. Y. C.
Grant Mfg. & Mach. Co., Bridgeport, Conn.
Linley Bros. Co., Bridgeport, Conn.

RIVET Sets
American Swiss File & Tool Co., Elizabeth, N. J.
Chicago Pneumatic Tool Co., N. Y. C.

RODS Welding
Lincoln Electric Co., Cleveland.
Linde Air Products Co., N. Y. C.
Union Carbide & Carbon Corp., N. Y. C.

RULES, Steel
Brown & Sharpe Mfg. Co., Providence, R. I.

RULES, Steel & Wood
Lufkin Rule Co., Saginaw, Mich.
Starrett Co., L. S., Athol, Mass.

RUST Preventives
Oakite Products, Inc., N. Y. C.

SAND Rammers, Pneumatic
Chicago Pneumatic Tool Co., N. Y. C.

SANDERS, Bench
Walls Sales Corp., N. Y. C.

SANDERS, Portable, Electric
Black and Decker Mfg. Co., Towson, Md.

SANDING Machines
Eisler Eng'r. Co., Newark, N. J.

SAW Frames & Blades, Hack
Starrett Co., L. S. Athol, Mass.

SAWING Machines, Band
Armstrong-Blum Mfg. Co., Chicago
Continental Mach. Specialties Co., Minneapolis, Minn.

SAWING Machines, Power Hack
Armstrong-Blum Mfg. Co., Chicago
Earle Gear & Mach. Co., Phila., Pa.
Peerless Machine Co., Racine, Wis.

SAWS, Band
Walls Sales Corp., N. Y. C.

SAWS, Hack
Armstrong-Blum Mfg. Co., Chicago
Black & Decker Mfg. Co., Towson, Md.

SAW, Metal Slitting
Pratt & Whitney (Div. Niles-Bennett-Pond Co., Hartford, Conn.

SAWS, Milling
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.

SAWS, Screw Slotting
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.
Starrett Co., L. S., Athol, Mass.
Union Twist Drill Co., Athol, Mass.

SCALES
Fairbanks, Morse & Co., Chicago
Starrett Co., L. S. Athol, Mass.

SCREW Drivers, Automatic
Errington Mech. Lab., Staten Island N. Y.

SCREW Drivers, Portable, Electric
Black & Decker Mfg. Co., Towson, Md.

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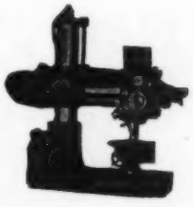

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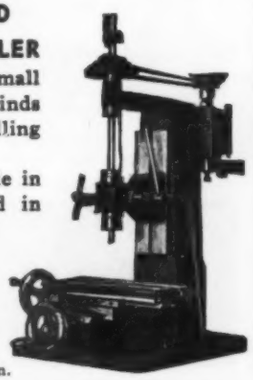

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WHERE-TO-BUY DIRECTORY

A Classified Index of Advertisers in this Issue

SCREW Machine Tools & Attachments
Brown & Sharpe Mfg. Co., Providence
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.

SCREW Machine Work
Eastern Mach. Screw Corp., New Haven, Conn.
National Acme Co., Cleveland
National Mach. Tool Co., Cincinnati

SCREW Machines
Allen Mfg. Co., Hartford, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Eastern Mach. Screw Corp., New Haven, Conn.
National Acme Co., Cleveland

SCREW Machines, Automatic & Semi-Automatic
Brown & Sharpe Mfg. Co., Providence
Cone Automatic Mach. Co., Windsor, Vt.
National Acme Co., Cleveland, Ohio

SCREW Machines, Plain or Hand
Gisholt Mach. Co., Madison, Wis.
Jones & Lamson Mach. Co., Springfield, Mass.
Warner & Swasey Co., Cleveland

SCREW Plates
Butterfield Div. Union Twist Drill Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mach. Co., New Bedford, Mass.

SCREW Threading Machines.
Brown & Sharpe Mfg. Co., Providence

SCREWS, Cap and Set
Allen Mfg. Co., Hartford, Conn.
Danly Mach. Specialties Co., Inc., Chicago
Eastern Mach. Screw Corp., New Haven, Conn.
National Acme Co., Cleveland
Strong Carlisle & Hammond Co.

SCREWS, Safety
Parker-Kalon Corp., N. Y. C.
Strong Carlisle & Hammond Co.

SCREWS, Self Topping
Parker-Kalon Corp., N. Y. C.

SCREWS, Shoulder
Allen Mfg. Co., Hartford, Conn.

SEPARATORS, Centrifugal
National Acme Co., Cleveland

SHAFTING
Allis-Chalmers Mfg. Co., Milwaukee
Bliss & Laughlin, Inc., Harvey, Ill., and Buffalo, N. Y.
Jones & Laughlin Steel Corp., Pittsburgh
National Tube Co., Pittsburgh
Ryerson & Son., Inc., Jos. T., Chicago
Strand & Co., N. A., Chicago

SHAFTS, Flexible
Haskins Co., R. G., Chicago
Strand & Co., N. A., Chicago

SHAPERS
American Tool Wks. Co., Cincinnati
Hanson-Whitney Mach. Co., Hartford, Conn.
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.

SHAPERS, Structural Steel
Carnegie-Illinois Steel Corp., Pittsburgh

SHAPERS
Cincinnati Shaper Co., Cincinnati
Potter & Johnston Mach. Co., Pawtucket, R. I.
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.
Smith & Mills Co., Cincinnati
Springfield Mach. Tool Co., Springfield, O.

SHAPES, Structural Steel
Jones & Laughlin Steel Corp., Pittsburgh

SHARPENING Stones
Carborundum Co., Niagara Falls

SHEARS, Power
Cincinnati Shaper Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Mitts & Merrill, Saginaw, Mich.
Modern Tool Wks., Rochester, N. Y.

SHEARS, V-Belt
Allis-Chalmers Mfg. Co., Milwaukee

SHEET Metal Working Machinery
Andrew C. Campbell Co., Bridgeport, Conn.
Cincinnati Shaper Co., Cincinnati

SHIELDS, Welding
Lincoln Electric Co., Cleveland

SHIMS, Laminated
Laminated Shim Co., Inc., Long Island City, N. Y.

SILVER
Cerro de Pasco Copper Corp., N. Y. C.

SLOTTING Machines
Consolidated Mach. Tool Corp., Rochester, N. Y.
Modern Tool Wks., Rochester, N. Y.

SOCKETS
Cleveland Twist Drill Co., Cleveland

SOCKETS, Detachable, Hand
Armstrong Brothers Tool Co., Chicago

SOCKETS and Sleeves
Standard Tool Co., Cleveland

SOCKETS, Wire Rope
Williams & Co., J. H., Buffalo, N. Y.

SPEED Reducers
Adams Co., Dubuque, Ia.
Cullman Wheel Co., Chicago
Earle Gear & Mach. Co., Philadelphia
Grant Gear Works, Boston
Hartford Special Mach. Co., Hartford, Conn.
James Co., D. O., Chicago
Link-Belt Co., Chicago
Morse Chain Co., Ithaca, N. Y.
Philadelphia Gear Wks., Phila., Pa.
Stahl Gear & Machine Co., N. Y. C.

SPEED Reducers, Motorized
James Co., D. O., Chicago

SPINDLES, Lathe and Milling Machine, Hollow Bored
American Hollow Boring Co., Erie, Pa.

SPRING Washers
American Nut & Bolt Fastener Co., Pittsburgh
Beall Tool Co., East Alton, Ill.
Butcher & Hart Mfg. Co., Toledo
Eaton Mfg. Co., Massillon, O.
Hobbs Mfg. Co., Worcester, Mass.
National Lock Washer Co., Newark, N. J. and Milwaukee, Wis.
Philadelphia Steel & Wire Corp., Germantown, Phila.
Positive Lock Washer Co., Newark, N. J.
Washburn Co., Worcester, Mass.

SPROCKETS
Cullman Wheel Co., Chicago
Grant Gear Wks., Boston
James Co., D. O., Chicago
Morse Chain Co., Ithaca, N. Y.
Philadelphia Gear Works, Phila., Pa.
Whitney Chain & Mfg. Co., Hartford, Conn.

SQUARES
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Starrett Co., I. S., Athol, Mass.

STAMPS, Steel
Noble & Westbrook Mfg. Co., Hartford, Conn.